Field Dependence and Independence and the Effect of Level of Guidance on Learning Performance for Associate Degree Nursing Students

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Abstract

Because of the continued need for nurses skilled at calculating drug dosages and the assumed responsibility of nurse educators for student competency, this study was conducted to determine the effects of minimum and maximum guided drug calculation instruction in relation to the student's cognitive style: field dependent (FD) or field independent (FI). The cognitive styles of 24 female nursing students, who were enrolled in the first year of an associate degree nursing program at a Midwestern community college, were tested using the Group Embedded Figures Test (GEFT). Students participated in pretest and posttest sessions to evaluate pharmacology calculation skills as well as in five intervention sessions. First, the pretest scores did not vary between the FD and FI groups. Second, the achievement scores between the matched groups, FD students with maximum guidance and FI students with minimum guidance were not significantly higher than the nonmatched groups, the FD students with minimum guidance and FI students with maximum guidance. Third, the nonmatched groups were significantly more satisfied with the teaching method than were the matched groups ($p<.05$).

Chapter I

The Research Problem

Scope of the Problem

Which nursing students learn best under what conditions? No answer is eminent in nursing education even though nurse educators continue to strive toward a more ideal learning environment. Since learning is the essential function of education, the primary role of the nurse educator is to assist students in learning. The conditions that facilitate learning vary for each individual learner, thus making the educator's task multidimensional. All facets of the teaching-learning process must be analyzed and incorporated into the learning process to accommodate the individuality of each nursing student.

The nucleus of the teaching-learning process is the learner. Educators cannot overlook the unique characteristics that are inherent in the nursing student. One attribute of the learner is the individual's cognitive style. Cognitive style is the consistent and unique way an individual functions. The individual processess information, thinks, perceives, and responds to stimuli in the environment. Within the the broader context of personality, cognitive style

extends beyond perceptual and intellectual activities to social domains of functioning, body concept, equilibrium of self, and inner defenses (Witkin, Oltman, Raskin, & Karp, 1971).

When considering the teaching-learning process, the nurse educator may be more likely to address conditions that facilitate learning by acknowledging initially the internal thinking, and perceiving modes of a learner. Cognitive style is one component of these relevant internal characteristics. In addition, instructional strategies that are more congruent with the student's personal mode of thinking, perceiving, and interacting may elicit a more positive response than an incongruent match of cognitive style and teaching strategy.

Learning needs are an integral component of the teaching-learning process that cannot be ignored by educators. Perhaps the learning environment may be more satisfying and productive for the learner and the teacher when educators are aware of individual learning attributes, such as cognitive style, and are amenable to adjusting instructional strategies by providing different methods of guided instruction.

Statement of the Problem

This study investigated the effects of two different types of instructional guidance when considering the construct of the cognitive style-field dependence and field independence. Academic achievement and satisfaction levels were analyzed for students instructed by minimum and maximum guidance when considering cognitive style of the students.

Analysis of the Problem

The nursing educator must be cognizant of conditions in which students learn best. Each individual learns in different ways. Cognitive style describes how an individual perceives stimuli, processes information, and responds to stimuli. Messick (1976) defined cognitive style "as stable attitudes, preferences, or habitual strategies determining a person's typical modes of perceiving, remembering, and problem solving" (p. 5). Each individual posseses a preferred way of organizing all that he or she sees, thinks about, and remembers (Messick, 1976).

Numerous constructs have evolved from the concept of cognitive style, but the construct of field dependence-independence is predominant in the

literature (Claxton & Ralston, 1978; Goodenough, Oltman, Friedman, Moore, Witkin, Owen, & Raskin, 1979; Guilford, 1980; Mezoff, 1980) and is most relevant to teaching-learning at the college level (Partridge, 1983; Schwen, Bednar, & Hodson, 1979).

The major identifying characteristics of the field dependent student include tendency to see a visual field as a whole, difficulty in identifying the subcomponents of a visual field, and difficulty imposing one's own structure on an unstructured field (Messick, 1976). The individual lacks the ability to structure the learning material or to use critical variables in analyzing or organizing a field lacking in structure, but manifests a diffuse and global perception.

Field independence has been characterized by the ability to separate a hidden figure from a complex surrounding field, the ability to visually see items as discrete from their background, and the ability to impose a sense of structure on an unstructured perceptual field (Mezoff, 1983). Researchers believe the FI individual utilizes a logical approach to problem solving by articulation, the ability to analyze the situation, and structure the experience, even when

the material is disorganized.

Research supports the conviction that cognitive style also influences the teaching-learning process (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962; Witkin, 1976). A student's cognitive style affects his or her way of perceiving and analyzing. Witkin, Moore, Goodenough, and Cox (1977) conceptualized relations between learning behavior and cognitive style using both cognitive and social characteristics. The influence of mediators in learning may have a varying influence on those individuals who were able to analyze a field when it is organized and to structure the field when it is unorganized when compared to those who were not able to analyze and structure the field. Cues within the learning environment may also be more useable for some individuals than others based on their perceptual differences. The social influences of reinforcement within the learning environment may also have an impact on the individual's learning.

Individuals with differing cognitive styles tend to favor different learning approaches. The type of instructional method with varying amounts of assistance may have an impact on the learning processes of the student because of the individual variations in

perceiving and responding to situations. One way of enhancing the learning environment may be to consider the student's preferred or more predominant instructional method derived from the inner cognitive processes may be one way of enhancing the learning environment.

A wide variety of dichotomous styles of instructional methods are present for their potential in improving student learning. The style chosen was based on the discovery-expository method developed around the sequence of instruction, the degree of instructor guidance, and the type of presentation methods used. The independent learning method or minimum instruction was coupled with maximum instruction, which was more specifically linked to the direct instruction concept or structured teaching.

Cognitive processes are not the sole component of learning. The affective domain must also be considered. Rogers (1969) believed the key to success in teaching is dependent largely upon the interpersonal relationships that are established between teacher and student. Interpersonal influences in the learning environment that evolve from thorough assessment of the learner, planning of congruent learning situations, and

implementation of strategies congruent with learner and teacher characteristics may influence learning outcomes.

The belief that the student possesses diverse learning needs continues to be an impetus in designing curriculum. Yet many educators continue to combine all students and primarily utilize one method of instruction. Few options exist for the student who is enrolled in core nursing courses that are vital to the nursing curriculum. For example, the instruction of pharmacology calculation is often incorporated in the nursing curriculum as a component of a nursing course or a section of a pharmacology course with one method of teaching drug calculations.

Educators are aware of their responsibility to teach drug calculation as an integral component of the curriculum. Providing instruction for all students is often a struggle. Worrell and Hodson (1989) found that in a sample of 223 baccalaureate, associate, and diploma programs, 82% of the programs identified math and dosage calculation deficiencies. Forty-one percent of the programs reported between 11% to 30% of their students deficient, and 41% responded that 31% or more

Results from a study by Brown (1979) of 40 hospitals indicated medication administration errors were the second most-reported incident in the hospital, and the wrong dose was the most frequent type of error. Worrell and Hodson (1989) noted that the data were based on medication errors reported by formal incident reports and not the number of medication administration errors made.

Davis and Cohen (1981) found error rates ranged from 5% to 20% of all medications administered in hospitals. Of these errors, 12% were due to miscalculation of drug dosages. This leads one to ask whether nurse educators are providing the best conditions for learning to occur.

Purpose of the Study

The purpose of this study was to investigate one aspect of cognitive style and the inherent educational implications for nursing students. The effects of two different teaching methods for first-year nursing students were examined in relation to their cognitive style in the area of pharmacology calculation instruction.

Specifically, the nursing students' achievement scores were explored when considering students'

cognitive style and preferred instructional strategy. Two types of teaching instruction were implemented during pharmacological dosage calculation instruction. A description of the students' level of satisfaction with each instructional mode for pharmacological calculations also was determined.

Limitations

This study was limited to nursing students who were enrolled in the first year of the associate degree nursing program at a community college. The sample consisted of a nonprobability convenience sample with 24 students participating throughout the seven-week study. Several of the intervention groups contained one or two students, thereby threatening both the internal and external validity of the study.

Variables that could not be controlled influenced the study. Although explicit verbal and written instructions were delineated to the instructors who participated in the study, individual instructors' teaching style and cognitive style were not variables considered for this research. The lengthy time span of 7 weeks from the onset of the study to the completion of the study was not considered. Because it was agency policy, the sessions contained content that was review

material from the previous semester. The lessons were presented entirely by independent study. Motivation was a variable that was not considered in this study. In view of these limitations, the study findings were interpreted with caution.

The instrument lacked reliablity. The same instrument was utilized for the pretest as the posttest. The internal validity of the study may have been further limited because of pretest/posttest sensitization.

A final limitation was labeling of the field dependent individual or field independent individual based on one paper-and-pencil test. Individual cognitive styles fell on a continuum and overlapped in some areas, but were classified as field dependent or field independent.

Assumptions

The underlying assumptions for the study were as follows:

1. Cognitive style can be identified.

2. Individual differences within one's cognitive style are a factor that influences learning.

3. Pharmacological calculations are an essential, basic cognitive skill required by a registered nurse

for safe practice.

4. The nurse educator's role includes developing teaching strategies based on individual characteristics that influence learning.

Research Hypotheses

The hypotheses tested in this study were as follows:

1. Achievement scores on a pharmacology calculation test will be higher when nursing students with a field dependent cognitive style are taught with maximum guided instruction than field dependent students who are not taught with maximum guided instruction.

2. Achievement scores on a pharmacology calculation test will be higher when nursing students with a field independent cognitive style are taught with minimum instruction than field independent students who are not taught with minimum guided instruction.

3. Nursing students whose cognitive styles are matched with instructional style will show greater satisfaction with the overall pharmacology calculation section of the course than students whose cognitive styles are not matched with instructional style.

4. Pretest scores on a pharmacology calculation test will be significantly higher for field independent nursing students than for field dependent nursing students.

5. There will be a relationship between nursing students' scores on a pharmacology calculation test and gender for field independent students taught with minimum guided instruction and field dependent students taught with maximum guided instruction.

Significance of Study to Nursing

If the learner's cognitive style is an essential attribute of the teaching-learning process, a congruent instructional strategy may be an additional variable to consider in implementing the teaching-learning process. Nursing curriculum for pharmacology calculations may need further development to provide a more contrasting approach to encompass all learners' strengths. By acknowledging the students' individual perceptual differences, the learning environment could potentially become a more positive experience for the student. The implications may extend to other areas within nursing education such as the classroom setting, laboratory, and the practicum area.

The concern for individual learning can be

incorporated into other specific components of nursing courses. The awareness of teacher-student relationships, both the similarities and the differences, may assist in understanding student's so-called weaknesses or areas needing improvement to pass a course.

The teacher may be more aware of the implications of cognitive styles and the effect on perceptions, intelligence, and interpersonal and social behavior throughout the nursing curriculum after the initial effects are explored for pharmacology instruction. One student may do well in individually directed classes, whereas another student may demonstrate more satisfaction or more desirable learning outcomes in content areas that are geared toward the student's capabilities. The student may be placed in a course that is more similar to his or her usual mode of functioning at the onset of the course rather than later in the course as the student encounters difficulties.

Even if the study is inconclusive, the instructors at this particular college may benefit by increasing their awareness of different cognitive styles and the educational implications. A review of cognitive styles

may enhance the professional growth of the nurse educator in areas such as assessment of learner needs, curriculum development, variations of teaching strategies, and evaluation methods. Instructors may become more aware of another method for accommodating the learner within the learning process.

In addition to professional development of the instructor, personal growth may be enhanced. As individuals who are enrolled in graduate courses and professional workshops, instructors may also benefit from further understanding of their own cognitive style and its influence within the learning environment.

More significantly, the body of knowledge within the profession of nursing will continue to evolve. Research on field dependence-independence currently is limited in nursing; in addition, it is lacking as a predominant topic in higher education. The need to expand and explore nursing knowledge is undeniable.

Specifically, for one Midwestern community college, the nursing student may be offered a wider variety of instructional strategies, at least for one semester, that may better meet his or her needs in the area of pharmacology calculations. The impetus to expand within the curriculum to ensure more individual

instruction may begin as a result of this study. The student who is aware of the instructors' attempts to develop the program to account for student individuality may have a more positive attitude about his or her learning experience and an expanded awareness of autonomy.

Individual differences make a difference. The research in cognition may be the key to the educational challenge as educators strive for a balanced approach to learning. This research study has been completed to assist with the pursuit of more successful nursing education.

Summary

Which nursing students learn best under what conditions? The individual processes each learner brings to the course need foremost attention when planning and updating courses and instructional units.

To explore several of the variables that contribute to the teaching-learning process may lead to advancement in other areas within nursing education. Although one area of instruction, pharmacology calculation instruction, requires a small segment of the nursing curriculum, it is an essential component needing a comprehensive focus to ensure long-range

quality client care. Pharmacology instruction cannot be ignored. Short-term benefits include students successfully completing the first term of the nursing program along with the satisfaction of mastering a critical component of the pharmacology section.

The purpose of the study was to consider variables included in the teaching-learning process, learner characteristics, and types of instructional methods for pharmacology instruction at a community college. The intent was to explore two instructional methods, minimum guidance and maximum guidance, based on the student's cognitive style for pharmacology instruction.

Chapter II

Review of the Literature

The review of the literature has a multiple focus and is organized into nine sections and concludes with a summary section. Initially, the conceptual framework is discussed briefly. Second, cognitive styles are described and reviewed. Third, predominant perceptual and intellectual behaviors are explored, followed by fourth, personal and social behaviors of the field dependent and field independent individual. Fifth, the educational implications of cognitive styles are examined. Sixth, the impact on achievement scores is discussed. Seventh, a review of the satisfaction of the student and the teacher is presented. The eighth section is directed toward instructional guidance, and the literature review concludes by outlining the need for the study, followed by the summary.

Conceptual Framework

The concept of cognitive style is based on characteristic modes of perceptual and intellectual functioning that each individual possesses. It is an attempt to understand and categorize individual variations in modes of perceiving, remembering, and thinking.

Five major attributes differentiate cognitive style

from cognitive ability. First, cognitive style influences how information is processed. The emphasis is on process- the measurement of characteristic modes of performance. Cognitive ability, however, refers to the content of cognition or the question of what information is processed and what cognitive operation occurs. The emphasis is on the level of accomplishment (Messick, 1976).

Second, cognitive style is bipolar. Two poles make up the continuum with each pole consisting of complex characteristics that dissect across many domains of functioning, thereby a varying degree of adaptability in different situations is allowed. Cognitive ability is unipolar, with the pole indicating superior or more significant characteristics as one moves toward the pole (Messick, 1976).

A third major distinguishing characteristic is in the value concept. Cognitive style is referred to as value-differentiated. The characteristics at each pole are more adaptive in different circumstances, such as during formal learning or in social interactions, than are the complex characteristics at the opposite end of the pole. Placement near one pole on the continuum does not imply that the individual is more adaptive overall, but that the individual is more flexible in different situations

because of varying combinations of processing characteristics. Cognitive ability is value-directional, in that possessing more of the ability is more desirable than possessing less (Messick, 1976). Because there is an implied deficiency with cognitive ability, cognitive style is less threatening to people and is easier to discuss than cognitive ability.

Fourth, cognitive style encompasses many domains in learning, such as cognition, behavior, attitudes, personality, and motivation. Cognitive style coordinates the functions of the above domains (Messick, 1976). Within each pole, the complex characteristics are similar across the areas of functioning. Cognitive ability is relatively limited to one area within a domain.

A fifth difference is the formation of the individual characteristics. Cognitive style develops slowly and is difficult to modify by training. Cognitive style is stable over time, whereas cognitive ability is influenced possibly by internal and external variables (Witkin & Goodenough, 1981).

Field dependence-independence (FDI) is one type of cognitive style that focused originally on perceptual behavior and was measured by a perceptual test. The test was concerned with the subject's perception of objects in

space and the relative position of oneself in space. Witkin, Moore, Goodenough, and Cox (1977) developed three methods to determine the extent to which "people locate the upright in space" (p. 2): the body-adjustment test (BAT), the rod-and-frame test (RFT), and the rotating-room test (RRT). Later, the Embedded Figures Test (EFT) and the Group Embedded Figures Test (GEFT) were introduced as tests in determining FDI (Witkin et al., 1971).

The BAT, RFT, and RRT tests measure slightly different perceptual functions. When the BAT is administered, the subject sits in a chair that is tilted independently of the room. The subject is asked to adjust the chair to an upright position. A second test, the RFT, is similar in that the visual framework, the rod, is tilted within a lighted frame. The task is to adjust the rod to the upright while the frame remains in its initial position. During the third test, the RRT, the subject is seated in a chair that is tilted in a room that moves in a circular motion. The visual field remains upright, and the subject is asked to bring his or her body to an upright position (Witkin & Goodenough, 1981).

The strong effect of the immediate surrounding field influences the subject's perceptions during all of the tests. The FD subject aligns the item with the room and

the visual field, and the FI subject ignores misleading visual forces and is able to determine the true upright as discrete from the surrounding external field (Witkin & Goodenough, 1981).

The Embedded Figures Test is a modified version of the basic principles in the BAT, RRT, and RFT. The EFT is an individual perception test that assesses the individual's competence at perceptual embedding, identifying a simple geometric design within an organized field of vertical and horizontal planes (Witkin et al., 1971). Again, differences in performance are apparent. The individual with more FI tendencies is able to identify the figure quickly, whereas the FD individual is not able to identify the simple figure within the time limit.

A high degree of consistency was found between the perceptual tests (EFT, RFT, BAT, and RRT) and the extent to which the surrounding organized field had influenced the person's perception of the item. These four tests are not feasible for group testing, therefore the Group Embedded Figures Test (GEFT), a modified EFT, often is chosen. The GEFT utilizes 18 complex figures with various degrees of shading to mimic the color patterns in the EFT. The test is designed so the complex and the simple figure cannot be viewed simultaneously, but can be reviewed as

many times as necessary within the 20-minute time frame. The FI individual is able to identify a greater number of the simple figures within the complex figures, thus the FI has a higher score than the FD individual who identifies fewer of the hidden figures. The influence of the surrounding field on the individual's perception of the parts of the field is measured.

Originally, the focus of FDI was on the perceptual domain as measured by perceptual tests. However, cognitive style is believed to transfer across other domains of functioning. The field dependence-independence construct addresses interpersonal and social behaviors that influence learning. The field dependent individual possesses a greater social orientation and better social skills. The person favors and performs well on tasks involved with other people. The field independent individual reflects an impersonal orientation (Witkin et al., 1962).

More recently, researchers believe field dependence-independence (FDI) encompasses a broader dimension in individual differences. The focus continues to include the perceptual domain as well as the global-articulated approach. The research focus currently includes additional domains influenced by cognitive style such as

body concept, self-identity, and use of specialized mechanisms such as isolation, repression, and denial (Witkin et al., 1962).

Individual differences in FDI are seen as related to individual differences in body concept. Body concept is one's conscious and unconscious perception of one's physical self. The focus is on the inner experiences. Evidence supports the concept that an FI individual possesses an articulated body concept or a perception of oneself that is whole with definite boundaries and limits that include parts discrete from the whole, yet the parts are interrelated. The FD individual possesses a global approach to body concept with more broadness and little perception of detail (Witkin et al., 1971).

Individuals also differ in their sense of separate identity in relation to their cognitive style (Witkin et al., 1971). The FI individual is aware of his or her own feelings and needs from a structured reference and sees these needs as separate and distinct from others. The FD individual has a less developed sense of separate identity and relies on external references for input on feelings and needs.

Finally, a relationship has been demonstrated between cognitive style and the nature of defenses. For example,

the FI individual uses a specialized defense, such as isolation. The feelings are kept discrete and possibly isolated. The FD individual's thoughts are influenced by feelings. He or she has a difficult time keeping perceptions separated (Witkin et al., 1962).

Perceptual/Intellectual Behaviors

The perceptual domain has been fundamental to the FDI cognitive style and has included primarily the ability to overcome an embedding context. Perceptual responses have extended into the intellectual domain of functioning (Witkin et al., 1971).

The concept of cognitive style does not imply that people are either field independent or field dependent, but rather that individuals are located on a continuum. Individuals are distributed on this continuum according to the relationship between the psychological domains.

The field independent pole of the continuum, as identified by the EFT and GEFT, is associated with an analytic, articulated approach to the surroundings. The individual utilizes an intelligent and logical approach to problem solving in general. The FI individual finds it easier to overcome the influence of the complex design in locating the simple figure than does the individual at the other end of the continuum. The field independent

individual experiences the surroundings analytically with objects separate from his or her background and is able to differentiate or disembed the information from the background. The FI individual performs well on tasks which require cognitive skills of analysis and structuring (Witkin, 1976; Mezoff, 1983).

The field dependent pole of the continuum is concerned with a global perceptual style. The individual tends to see the whole rather than the parts of the design. The subject experiences surroundings in a relatively global fashion and conforms passively to the influence of the environment or context (Witkin & Goodenough, 1981). In problem solving, the field dependent individual reports to have difficulty restructuring problems or utilizing critical variables that require identification of a certain main point from the context of the problem when analyzing an unorganized situation, as well as difficulty using the point in a different context (Witkin, 1976).

Summarizing the impact of perceptual and intellectual functioning on FDI, Witkin et al., (1971) concluded

> In other words, while field-independent persons are markedly superior on the Wechsler analytic triad, they are not predicably different on the verbal-

> comprehension or attention-concentration triads. While moderate correlations are found between full-scale IQ and EFT scores, the evidence cited indicates that these correlations are attributable to one of the three factorial ingredients of the full-scale IQ. One cannot say that persons who are field independent on the EFT are superior in general intelligence, as reflected in the Wechsler, since they may show wide variations in the other two IQ factors (pp. 6-7).

The major emphasis of FDI remains on process rather than the content of cognition.

Personal/Social Behaviors

Personal and social characteristics associated with contrasting cognitive styles also influence the teaching-learning process (Witkin et al., 1962; Witkin, 1976). An individual's cognitive style influences his or her way of responding to a situation.

The FI individual is more differentiated and possesses a stronger sense of self within the environment. This person functions more autonomously and focuses more on tasks than on the interpersonal relationship (Witkin & Goodenough, 1977). The FD individual tends to like to be with people, he/she "prefers to be physically close to

people, and . . . emotionally open" (Witkin & Goodenough, 1977, p. 661).

The social external qualities of the FD individual assist his or her ability to get along with people. The FI person tends to have a more impersonal orientation to others (Witkin, Moore, Goodenough, & Cox, 1977). The FDI cognitive style is seen as an adaptation to the inherent tendency to function in accordance with either external or internal referents within an individual's degree of differentiation (Mezoff, 1983).

The field dependent individual differs from the field independent individual in social frames of reference. Messick and Damarin (1964) studied 50 university students and found an increased ability of the field dependent student to recall more photographed faces than the field independent student. A study by Goldberger and Bendich (1972) revealed that the FD individual, as measured by the RFT, EFT, and Human Figure Drawings Test, responded to word association testing by recalling more socially based words than neutral words. Eighteen female undergraduate and graduate volunteers were utilized for the study.

Loranger, Gosselin, and Kaley (1984) studied 29 adolescent boys and found that FI students, as determined by the EFT, were more disruptive than FD students; the

variation in social behavior was primarily due to the course content, French or mathematics. The students were consistent in 18 other behaviors. Therefore, except for disruptive behavior, cognitive style was not related to classroom social behavior and course content.

Witkin and Goodenough (1981) described the FD learner as possessing a greater need for social approval and, consequently, conformed more to social norms. The field independent learner was more inconsiderate in social environments.

An additional denotative characteristic of FDI cognitive styles is the contrasting social and personal orientations of career differentiation. The individual favored careers that were more similar to his or own characteristic behaviors noted within each dimension of the FDI continuum (Witkin, 1976).

The academic major and specialities also varied along with cognitive, social, and interpersonal relationships demonstrated by field dependent and field independent individuals. The field independent person favored areas such as mathematics, natural science, music, art, and engineering, whereas the field dependent individual tended to favor education, clinical psychology, nursing, and social work. The individual also chose specialities

within his or her areas that were more congruent with his or her perceptual functioning (Witkin, Moore, Oltman, Goodenough, Friedman, Owen, & Raskin, 1977).

Goodenough et al., (1979) suggested that FDI cognitive styles play a role in determining which individuals eventually entered medical school in a longitudinal study of 787 male individuals. The GEFT was the instrument used in the study. The findings indicated a greater number of the medical student applicants and enrollees were significantly more field independent than nonapplicants, although at the premedical level there was no significant difference in the number of field dependent and field independent enrollees. The results indicated a tendency for FI premedical students to remain within the system and to be more likely to become medical students.

A second longitudinal study was conducted to examine medical students' cognitive style and their specialty practice areas. The 111 male medical students were given the EFT to determine FDI. Of the FD and FI individuals in the study, the FD medical students chose a specialty area such as psychiatry or internal medicine that required greater social-interpersonal involvment than the FI medical students, who chose more impersonal areas such as surgery and radiology (Goodenough et al., 1979).

Similar results were found in other health care professionals' choices of specialty careers. In a study conducted by Quinlan and Blatt (1972), psychiatric nurses tended to be field dependent, and surgical nurses were more inclined to be field independent.

Witkin, Moore, Goodenough, & Cox (1977) indicated "small but persistent sex differences" (p. 51) with regard to cognitive style. Although there is overlap, women tend to be more FD, and males more FI. Claxton and Ralston (1978) clarified this concept by stating, "Genetic factors are no doubt important, although less so than socialization and child-rearing experiences" (p. 11).

Educational Implications

Essential components of the teaching-learning process also include the individual learner's characteristics. The student's cognitive style may influence the attitude about a topic, the behavior within the classroom, the preferred or more satisfying teaching method, the interaction with the teacher, and the learning outcome. Although all of these areas may be manipulated, the available research in higher education was limited in those areas. Most research on cognitive styles was conducted at the elementary or secondary level.

Literature in nursing research also was extremely limited in this area.

The indvidual's cognitive style, which includes personal and social characteristics, affects how the student learns. The four areas that vary between field dependence and field independence include: the learning of social material, the effects of reinforcement, the use of mediators in learning, and cue salience (Witkin, Moore, Goodenough, & Cox, 1977).

First, the FD learner was better at learning material with a social context. This may be due to his or her selective attention to external cues and points of reference in the environment and his or her social frames of reference in the environment. The FI learner was more inattentive in social learning situations, rather than lacking in actual ability to perform in these situations (Witkin, Moore, Goodenough, & Cox, 1977).

Second, reinforcements affected the FD learner differently than the FI individual. The FD learner relied on external referents for self-definition. Consequently, the individual requires more externally defined goals and reinforcements than the FI individual who was directed by intrinsic motivation. Verbal feedback acquired the form of positive strokes for praise and criticism for

undesirable behavior. The FD person was more affected by the negative comments than the FI individual (Witkin, Moore, Goodenough, & Cox, 1977).

The use of mediators in the learning situation was a third variation in student learning when cognitive style was considered. The individual who tended to be field independent was more likely to analyze a field when it was organized and to impose structure on a field when it lacked organization. The individual with a more global or FD style of learning was more likely to follow the field as it was without instituting any mediational processes such as analysis, structure, or organization (Witkin, Moore, Goodenough, & Cox, 1977).

Highly structured learning materials benefited the FD individual. If lecture was presented in an unclear structural format, the FD individual was at a disadvantage because of the lack of mediators in the learning setting. Conversely, the field independent individual made more use of mediators. The FI student possessed the ability to impose structure on an unstructured or unclear design (Witkin, Moore, Goodenough, & Cox, 1977).

The use of cue salience was the last difference between FD and FI students with respect to overall learning as reported by Witkin, Moore, Goodenough, & Cox,

1977. The field independent individual learned from both salient and less salient cues. The FD student tended to learn better from the obvious cues in the learning material or the environment (Witkin, Moore, Goodenough, & Cox, 1977).

The effects of these four broad variables on the student's learning style were neither good nor bad, neither better nor worse for the learner. The differences were within the actual learning task and within the characteristics specific for the completion of the learning task.

Hodson (1985) compared 6 FI nursing students to 6 FD nursing students in clinical nursing behaviors. All 12 students were enrolled in a medical-surgical rotation in a baccalaureate program. The cognitive style was determined by scores on the GEFT. Overall, the researcher found a statistically significant difference between FI and FD nursing students in the structure, quality, and interpersonal aspects of clinical behavior ($p<0.05$). In the study FI student nurses functioned more autonomously, which was reflected in a decreased amount of time with the instructor and more time with specific activities. The FD nursing student had a significantly greater proportion of activities involving the instructor.

A second area in Hodson's study included the use of external references or assistance in the environment by the FD students. Field dependent individuals were more likely to initiate activities, while the FI students interacted in more activities that were initiated by others. The FD individuals needed to interact and obtain information from others (Witkin & Goodenough, 1977).

Hodson (1985) also concluded that there was a significant difference in the number of other people in the clinical setting with whom the student interacted. Field dependent individuals showed a higher percentage of activities dealing with two or more persons. In addition, the FD students interacted in social contacts at a faster rate.

Within the teaching-learning process, the teacher also possessed behaviors characteristic of his or her inherent cognitive style. Claxton and Ralston (1978) indicated FD teachers favor a teaching style that includes student interactions with a teacher who facilitates discussion. Teachers identified as FI preferred lecture as the teaching strategy and an authoritarian environment.

The student also possessed a preference for instructional styles. The field dependent student ordinarily preferred discussion as a discovery mode of

learning. Conversely, the FI student was more skillful in situations that required intrinsic motivation to learn, such as with the lecture method of teaching (Peterson & Eden, 1981).

Seidl and Sauter (1990) explored the learning styles of 129 traditional and nontraditional nursing students enrolled in an introduction nursing course at a university. The nontraditional students, those who were beyond 21 years of age and had experienced interruptions in their education, were significantly more discovery learners ($t=2.88$, $p<0.01$) than receptive learners. The discovery learners preferred to encounter information in a less structured method and were able to inductively organize the material. The receptive learners preferred to have information presented in a systematic and complete manner. When considering the student's own preferred type of learning, no significant difference was found between the traditional and nontraditional students regarding the method by which they preferred to learn.

Lange (1972) studied the effects on learning by matching cognitive style and preferred instructional style of nursing students and instructors at a community college and investigated the impact on the failure-withdrawal rate. The study of 255 male and female nursing

students and 33 nursing faculty at a community college identified the cognitive style by utilizing 10 separate testing devices including reading, auditory, olfactory, visual, tactile, and savory components. Although the author found no significant differences in the failure-withdrawal rate between matched and mismatched groups, other significant findings occurred in students' perceptions of their teachers.

The concept of student's and faculty's matched styles demonstrated a positive impact on students' perceptions of instructors. The students who were matched with their instructors on the basis of cognitive style and preferred teaching style perceived their instructors more positive than students who were mismatched (Lange, 1972).

Attitudes within the classroom also were influenced by individuals of different cognitive styles. According to DiStefano (1969), the instructor who was assigned students with a similar cognitive style valued the students' personality characteristics and intellectual abilities significantly more than the instructor with mismatched students. More specifically, the FI instructor, as determined by EFT, was more critical of field independent students on traits involving mastery and intellect than was the FD instructor in relation to FD

students. It is interesting that the FD instructor was more critical of the FD students in regard to social behaviors.

Educators who are aware of their student's cognitive style may have an impact on the student's learning. Lange (1972) examined this viewpoint while matching similar nursing student and teacher cognitive styles; she also was interested in matching instructional styles to cognitive styles. Lange found that 70% of nursing faculty perceived the matching of student's cognitive style and preferred instructional style to be beneficial in the teaching-learning process. An additional benefit indicated by faculty "was the improved communication among the faculty and an increased tolerance for behaviors which might ordinarily be more criticized than understood" (p. 120).

A later study by Doebler and Eicke (1979) also supported the importance of instructor's awareness of his or her student's cognitive style. Cognitive styles of 296 fifth-grade students and 10 teachers at three elementary schools were identified by the EFT. The treatment for the teachers in the experimental groups consisted of an initial seminar on FDI cognitive style, educational implications such as how students learn, how teachers teach, and how students and teachers interact, along with

a list of those students in the study and their cognitive style. After the initial seminar, six brief follow-up sessions were included. The students completed the Self Appraisal Inventory (SAI) as a measurement of student's self-concept in areas of family, scholastic achievement, peer relations, and general aspects before and after the treatment. Second, the students completed a School Sentiment Index (SSI) to measure the students' attitudes toward school in the areas of teacher, learning, social structure and climate, peers, and general attitude. The instruments were administered as pretests and posttests.

The data analysis indicated significantly higher posttest scores in the experiemental schools for students' self-concept and attitudes toward school. The study contradicted the findings of DiStefano (1969) and Lange (1972) and suggested that improved relationships can be obtained by increasing teacher's awareness of cognitive styles and the educational implications of this knowledge.

Achievement

The research findings were less conclusive when achievement or learning performance was examined. Achievement levels did vary when field dependence and field independence were compared to each other without regard for type of instructional methods.

Stevens (1983) studied 73 university students' successes in a computer course. Students who were FI on the GEFT had significantly higher achievement scores than FI students. Both FD and FI subjects did well on the societal and educational usage of computers, however, the FI students achieved higher scores on the technical aspects of computer programming.

Achievement scores varied in a study conducted by Copeland (1983) for an undergraduate population of 129 male and female students. The GEFT was administered to the students and to the 2 male instructors. The findings indicated that students who had higher GEFT scores received higher course grades and that students with lower GEFT scores, or more FD in nature, received lower course grades.

Forty-four high school students were measured in mathematics achievement and cognitive style. The GEFT was the instrument administered in the study. A significantly greater number of FD students were low-achieving students in geometry courses (Mrosla, Black, & Hardy, 1987).

Norris (1986) compared the effects of two methods of instruction, role play, and lecture, and learner characteristics such as learning style and maturation. Traditional and nontraditional nursing students (n=147)

from a baccalaureate nursing program were categorized as FD or FI by scores on the Hidden Figures Test. Field independent students achieved significantly higher mean scores on objective tests than did field dependent students.

Lange (1972) did find a significant difference in mean scores in final course grades of students who were matched with teacher's cognitive style and instructional style. The instructional mode itself was not a significant influence on final grades. Therefore, it appeared that assignment to a mode of instruction based on the cognitive style of the students was a more important influence on the students' achievement than the instructional mode itself.

The research was based on testing not previously noted in the literature for determination of cognitive style and teaching style. The cognitive style was determined by a testing procedure that included 10 separate testing devices including reading, auditory, olfactory, visual, tactile, and savory. The focus was to determine theoretical, qualitative and perceptive abilities. Teaching style was identified as either authoritarian or permissive, with certain criteria for degree of flexibility. The instructional methods for the

study were autotutorial laboratory, small group discussion, and independent reading only (Lange, 1972).

Thornell (1977) looked at the relationships between FDI and two instructional strategies varying in degree of written guidance. The subjects for the study were 60 elementary students who were measured for FDI by the Children's Embedded Figures Test, the children's version of the EFT. The subjects were randomly assigned to two groups and were taught mathematic concepts via two different types of self-instruction booklets; one included intermediate guidance and the other maximum guidance.

Thornell (1977) found that field independents performed significantly better on the posttest regardless of the type of instruction. No difference was noted in achievement levels between students taught by intermediate guidance and by maximum guidance. The researcher noted significant limitations: The instruction period was too short and consisted of three one-hour sessions, the students were unable to ask questions of the instructor, the instructional materials were not accommodating the learning mode of the field dependent students, and the study grouped students as FD or FI without identifying students who fell in the middle of the continuum.

Threadgill (1979) identified similar results.

Based on scores obtained from a simplified version of the Hidden Figures Test, 60 junior high students were categorized as FD for scores lower than one standard deviation below the mean and FI for scores higher than one standard deviation above the mean. Two treatments were developed for the study: didactic presentation and guided discovery presentation. The main effect of instructional treatments was not statistically significant.

Hahn (1984) grouped 128 undergraduate and graduate students into treatment groups based on their GEFT score. The study compared the effectiveness of instructional treatments including lecture, a programmed instructional packet, and computer-assisted instruction with individual cognitive styles. The FI students achieved the highest mean scores in both the computer-assisted instruction and the programmed instruction. Field independent students were able to differentiate background cues from insignificant cues and organize and reorganize content. There also was a significant difference between the FD students' scores when the computer-assisted instruction and the lecture method of instruction were compared. The well-organized and systematic presentation of the computer-aided instruction was more beneficial than the lecture method of instruction.

Research in learning of mathematics has branched out to include aptitude-treatment interaction (ATI): the use of treatments that are designed for students with certain characteristics or aptitutes and the interactions between these variables (Cronbach & Snow, 1977). Different aptitudes can be selected, but a common aptitude is FDI as a cognitive style.

McLeod, Carpenter, McCormack, and Skvarcius (1978) investigated the relationship between FDI and two types of instructional methods, minimal guidance and maximal guidance, for college students. The FDI was determined by the Hidden Figures Test (HFT), a version of the EFT. There was no significant difference between achievement score means as a function of the level of guidance. However, the study supported a significant interaction between level of guidance and FDI. The field independent students performed better when allowed to work independently, or with minimal guidance. The field dependent students performed at a more superior level when given extra guidance.

McLeod and Adams (1979) also found that FI elementary students achieved best when subjected to minimal guidance on printed material and that FD students learned best when subjected to printed material with maximal guidance. The

46 students completed the HFT to determine cognitive style. For minimal guidance, the instructor provided little instruction and encouraged the students to return to the printed material for answers to their questions. More structure and sample problems were presented for maximal guidance, in addition to following the printed material closely.

Student/Teacher Satisfaction

Although lacking in conclusive evidence with regard to instructional mode and achievement level, Lange (1972) found a significant difference concerning nursing students' level of satisfaction when assigned to an instructional mode (group discussion and auto-tutorial) that was based on their cognitive style. Students viewed the experience as a welcome change and indicated a preference to have a choice in the future among different available instructional modes.

Instructional Guidance

A major area of concern for educators has been the utilization of an instructional method that is appropriate to the learners' needs. Seidl and Sauter (1990) compared traditional and nontraditional groups of nursing students at an university to their learning style. Nontraditional students were more strongly characterized as discovery

learners (t=2.88, p<0.01).

Ostrow (1986) investigated the interaction of cognitive style, teaching methodology, and cumulative GPA in 75 undergraduate nursing students. The teaching methodologies utilized in the study were lecture and personalized system of instruction (PSI), a method of instruction with written objectives and guidelines. Three forms of quizzes that were administered at the students' convenience were available for each unit. Faculty members served as proctors in the class that met to renew study guides, complete quiz-taking, and obtain feedback. The hypothesis that FD students would score higher in the PSI condition was not supported. However, all students in the PSI treatment performed significantly better on the exam regardless of cognitive style.

These findings indicated that the students' cognitive style was not a significant influence on their performance or their satisfaction with an instructional method. The validity of the GEFT was questioned. In addition, the researcher suggested that the learners may be more field independent with increasing levels of maturity; consequently, the adult learners may be able to adapt and utilize more analytical skills when subjected to different instructional methods. Finally, the researcher questioned

the learners' cognitive style as a key determiner of success and suggested that the intellectual ability and instructional method may be predominant factors.

Direct instruction (DI) theory is one of the many types of instruction intervention found in the literature. The theory originated in the behavioral systems theory. Direct instruction is a systematic approach to the teaching-learning process with the focus on promoting learning in reading and mathematics and was designed especially for students from lower socioeconomic backgrounds (Jacobs & Welch, 1983). The goal of DI is to maximize student learning time by identifying tasks, dividing the tasks into small steps that advocate individual pacing, and offering a variety of practice activities in an environment controlled by the teacher (Jacobs & Welch, 1983).

More specifically, direct instruction theory includes five major phases. Initially, the environment is guided by the teacher who creates a postitive atmosphere by ensuring a high success rate for the student by demonstrating enthusiasm with the content and teaching strategy. The teacher maintains a high degree of control with the progression of the instructional session by organizing the topic according to the teacher's structure,

staying on the topic, and limiting the students' choices during the session (Jacobs & Welch, 1983).

The first phase of DI theory is the orientation component. A basic underlying principle during this phase is to prepare the students for the task of the session. Before the teacher can efficiently teach a student anything, the student's attention must be focused on the task (Jacobs & Welch, 1983). After obtaining each student's attention, the instructor reviews the previous lesson by solving one to two problems. Next, the student is oriented to the objectives of the lesson. Finally, the instructor reviews the procedures for the lesson with the student (Jacobs & Welch, 1983).

The presentation component follows the orientation component of the lesson. The material is presented in small steps with rules given for each step. The teacher provides four to five visual and verbal examples and allows time between the small steps and examples for questions. An example remains on the chalkboard for future reference. Two to three more examples are directed at specific students by the teacher, allows all students time to work the problem, and then returns to the chosen student for the response. During the period of reviewing the examples, the teacher may make one intentional

mistake, and the student who identifies the error is verbally praised (Jacobs & Welch, 1983).

The third phase is the structured practice component. The structured practice consists of five examples listed on the board. The student is praised for a correct response. An incorrect student response elicits the teacher's response of -No- and the teacher gives hints or clues that refer back to the visual example. The teacher includes a follow-up with this student by ensuring the student receives three positive responses to every one negative response (Jacobs & Welch, 1983).

To progress to the fourth phase, guided practice, the students must have responded correctly to four of the five problems as a group, or the teacher assumes the preparation is inadequate and continues with a set of five more examples. The group which progresses to the guided practice component is given a worksheet assignment of five problems to complete in class. The teacher moves throughout the room giving individual feedback, reinforcing correct practice, and referring the student to the initial visual example for incorrect responses (Jacobs & Welch, 1983).

The minimum instruction guidelines followed a more informal organization with the individual taking

control of the sequencing of the instruction. The instructor guidance is limited to student-initiated interaction.

Need for the Study

The literature presented an array of research on cognitive styles in disciplines other than nursing. Although more recent research has involved the post-secondary student, the focus of many education and psychology investigations focused on the elementary or secondary student. Limited nursing research has been conducted in this area. The conclusions that were formulated are tentative in nature, and more replication is needed. Before these principles can be applied in nursing education, empirical data need to be generated from nursing students.

Research in nursing is vital for the progression of nursing as a profession. With the recent emphasis on clinically oriented research, the impetus to conduct research in nursing education has declined to less than a quarter of all published research in the major research journals (Brown, Tanner, & Padrick, 1984). In addition to the decreased number of studies, Tanner and Lindeman (1987) suggested that nursing education research has lacked a theoretical basis, has not always been a clear

extension from existing knowledge, and application to the classroom and clinical areas has been difficult.

In addition to limited nursing education research, the educational institutions are facing a new type of student for whom traditional measures may not be appropriate to encourage success and retain the student. The inability of nursing programs to find qualified candidates and to keep them in the program is reaching unsurmountable numbers. Rosenfeld (1987) indicated that nationwide there are diminishing numbers of applicants interested in nursing, which is resulting in colleges lowering their admission standards to attract more students. Fewer students are proportionately enrolled in the same number of institutions for many reasons.

In addition, retention of students is an issue. Rosenfeld (1987) concluded, in an 1986 annual survey of NLN-accredited nursing programs, that 50% of the responding programs were having retention problems. Of those programs, two-thirds attributed the problem to the inability of the student to maintain a satisfactory grade in the program.

The solution to this situation is not apparent. The goal of educators is to provide a learning environment that encourages students to have the

opportunity to perform at a satisfactory level. The solution does not include lowering standards. The profession will suffer, as will the consumer. Although not a solution in itself, increased efforts in facilitating student success may assist in promoting positive effects during this crisis.

If nursing programs cannot guarantee an opportunity for success, the programs may need to offer remedial courses. According to Rosenfeld (1987), 75% of associate degree programs offer remediation in reading, math, and study skills; 50% of baccalaureate programs offer academic assistance.

Remedial assistance is often the responsibility of nurse educators. Extensive time and energy is spent trying to facilitate student learning in the area of basic math concepts to prepare students for drug calculations. The focus is on basic mathematical principles before the instruction can begin on the pharmacology section. Many institutions adapt self-learning or modular-type instruction for these basic skills when the student may not learn best in those situations.

Is the student placed in the situation that best facilitates learning, or has the educator unknowingly set

some of the students up for failure? The intent of this study was to contribute to the body of nursing knowledge in the area of nursing education, to provide an impetus to deal with retention of the student by offering a multi-dimensional approach to learning, and to assist nursing students in completing nursing pharmacology calculations more successfully by addressing individual learning needs. To assess individual student differences, to plan the instructional strategies with regard for the student's individuality, and to implement the methods accordingly may indeed decrease student frustration and assist with the learning process.

Summary

Cognitive style encompasses numerous psychological domains and may not be limited to the perceptual, intellectual, personal, and social domains. Characteristics of the individual who fall at one end of the bipolar cognitive style continuum are different from the characteristics of the individual at the other end.

The individual with more field dependent characteristics demonstrates certain behaviors that are consistent across the domains, whereas the field independent individual exhibits a cluster of different characteristics. The field dependent person perceives his

or her surrounding environment in a more global way and conforms to that surrounding environment. The field independent individual experiences the surrounding environment more analytically or discrete from his or her background. These characteristics extend across more domains than the perceptual domain.

The nursing student is affected by the educational implications inherent in the concept of cognitive style as well. A substantial amount of research documented increased achievement in terms of scores for the field independent student when compared to a field dependent student (Copeland, 1983; Hahn, 1984; Mrosla et al., 1987; Norris, 1986; Stevens, 1983; Thornell, 1977). A critical component was not addressed: What were the effects when instructional mode is congruent with cognitive style?

The multidimensional approach to the concept of cognitive style excluded studies in the nursing profession and other areas within higher education. This investigation was intended to provide more information regarding cognitive styles as well as assist nursing educators in their quest for providing the best educational conditions conducive to learning.

Chapter III

Methodology

Design of the Study

A pretest-posttest design was implemented for this quasi-experimental study. The study was designed to determine the effects of two types of instructional guidance for pharmacology calculation instruction based on the student's cognitive style. The independent variables were levels of instructional guidance, minimum guidance and maximum guidance, and cognitive style. The two dependent variables in this study were the learning performance as measured by the pharmacology instrument and the degree of satisfaction as determined by a questionnaire. Descriptive variables measured were cognitive style, age, and gender.

Operational Definitions

For the purposes of the study the following terms were defined:

Field dependence (FD): a perceptual mode of functioning where the overall organization of a complex visual design dominated the surrounding field. FD was determined and measured by the Group Embedded Figures Test. Scores of 8 or less on the GEFT were FD.

Field independence (FI): a perceptual mode of functioning where the parts of a visual field were experienced as discrete from the organized field. FI was measured by the GEFT and included scores of 10 or above (The score of 9 was not included).

Instructional guidance: the consistency of an instructor's responses and behaviors in the teacher-learner relationship as determined by the criteria for minimum guidance (Appendix D) and maximum guidance (Appendix E).

Achievement score: as measured by the score on the pharmacology posttest minus the pretest score.

Satisfaction: the degree to which the student perceived contentment or enjoyment as measured by a 5-item instrument using a 5-point Likert scale. Scores could range from 0 to 25, with the most satisfied yielding the highest score.

Setting, Sample, and Sampling Plan

The target population of this study consisted of nursing students enrolled in a community college nursing program designed for students seeking an associate degree in nursing in a rural Midwestern state. Two of the four college campuses, designated for purposes of this study as Campus A and Campus B, were utilized.

Campus A is located near a metropolitan area with a student body of 6,200. Campus B is located in a rural setting with a student body of 800.

The invited sample consisted of 100 male and female nursing students, 70 students on Campus A and 30 on Campus B who were enrolled in course ASDN210, Nursing Practicum II, in the associate degree nursing program during the Spring 1989 semester. Their ages ranged from 17 to 57 years.

The researcher introduced the study to the students during the first session of the course during the week of January 19, 1989. The students were informed that the purpose of the study was to review the method of teaching drug calculations at the college. Five main points were enumerated during the initial overview of the study: (a) students volunteered for the study in order to participate; (b) students who chose to volunteer signed the consent form in the appropriate area and students who chose not to participate also signed the form in the appropriate area; (c) participation in no way influenced the students' grade in the course or his or her status as a student; (d) students could notify the researcher or the researcher's advisor at Drake University at any

time the students had any questions or concerns; (e) students could drop out of the study by notifying the immediate nursing instructor, the researcher, or Dr. Linda Brady (the advisor for the study) without being penalized for terminating participation in the study. The students were given a copy of the consent form with the information included. The students were asked to mark their first preference and second preference from the list of available sessions (Appendix A).

Fifty students volunteered to participate from Campus A and 29 students from Campus B. Students were placed in one of the eight sections based on the following criteria: students were assigned sections on their respective campus; students were assigned based on their preferred section for the instructional sessions and chosen by them for their convenience. Five sections of students were grouped on Campus B with 10 students in Sections 1, 2, and 5, 9 students in Section 3, and 6 students in Section 4. Three sections of students on Campus B included a group of 10 students in Sections 6 and 7 and 9 students in Section 8.

The design for the study also included acquiring faculty members to assist with the instructional session. All faculty members (full-time and part-time

contracted faculty) who currently were instructing students in ASDN210, the laboratory component of the second semester nursing course, were asked to participate. Faculty were chosen based on their willingness to participate and their availability for the seven sessions derived from their existing teaching schedule.

A basic statement about the purpose of the research study was presented. Faculty members were given the choice of instructing minimum or maximum guided sessions. Four instructors volunteered to assist with the study on Campus A with three choosing minimum instruction sections and one choosing maximum instruction sections. The researcher claimed a section of maximum guidance. On Campus B, two instructors volunteered to participate in the study, with one instructor requesting a maximum guidance section and the other a minimum guidance section. Again, the researcher requested a maximum guidance section.

Procedure

After obtaining permission to conduct the study from the Human Subjects Research Review Committee at Drake University (Appendix B), written permission was obtained from the Director of Nursing Education for the

two campuses included in the study (Appendix C).

The researcher met with nursing faculty involved with the second semester nursing course and explained the major hypothesis of the study during December 1988 faculty meetings. Specific details were not presented in an attempt to decrease instructor bias in the role as adminstrator of the intervention component of the study. The six faculty members participating in the study were instructed. Expectations for the study included a 60-minute training period in January that was scheduled during a planned luncheon by the researcher at an all-day campus meeting, a 60-minute session to administer the GEFT and pharmacology instrument as a pretest, five 30-minute student instructional sessions, one 45-minute session to complete the satisfaction instrument and the pharmacology posttest instrument at the completion of the study.

The nursing students were informed of the study during the ASDN210 class period during the first week of the Spring semester. The researcher presented a brief explanation of the study and expectations of the students who participated. The required expectations for the students included the following: (a) attend

one 60-minute session during the week of January 23, 1989, to complete a 20-minute figures exercise that required the students to pick shapes from a larger design and to complete a 30-minute, 18-item instrument on pharmacology calculations, (b) attend five 30-minute instructional sessions on pharmacology calculations during the first hour of practice lab from January 30 through February 24, (c) complete a 20-minute, 18-item pharmacology instrument during the week of March 6, (d) complete a 5-item questionnaire on their feelings regarding the instructional method administered during the sessions on pharmacology instruction.

After thoroughly reviewing the students' expectations and answering questions, the consent to participate was obtained. The consent forms were distributed by the researcher and signed by all students stating they agreed to participate or they refused to participate. Attached to the consent form was a list of available sections for the students to indicate their first and second choice of sessions and their phone numbers in case the researcher needed to make alternate arrangements with the subjects. Thirty minutes were allowed for the presentation, questions and signatures.

The researcher compiled a time schedule of the 79 student subjects during the week. A copy of the assigned sessions was distributed to the students via the students' mailboxes by the end of the first week of the semester.

The first session began the following week, January 23. Twenty minutes were allowed for the GEFT to be completed. The student recorded a four-digit number on the GEFT and subsequent forms for the remainder of the study. The numbering system was familiar to the students because it had been required on previous course exams as a mechanism to assure confidentiality of scores.

Also during the initial session, the pharmacology instrument was completed. The students recorded the same four-digit number on the instrument in the appropriate blank following 2 minutes of instruction. The students were given 30 minutes to complete the instrument. Students were allowed to review the instrument by making an appointment during the next 5 days with the assigned instructor.

The intervention components began during the next week, or the second session, the week of January 30 and continued through the week of February 27. Five 30-

minute sessions were conducted by the assigned volunteer instructors. Three sections were cancelled one week because of inclement weather and rescheduled for the following week.

The final session was held during the week of March 13. The subjects completed the pharmacology instrument with a 30-minute limit as well as the satisfaction questionnaire. The subjects were given as much time as needed to complete the one-page satisfaction form. The subjects recorded the four-digit identification number on both instruments.

Intervention

All volunteer students were given the opportunity to participate in the intervention component of the study. The intervention sessions were held during the student's free time to protect the student from mandatory participation, to avoid intervention during scheduled courses, and to ensure total voluntary participation. Students were informed that there would be no charge for the instructional sessions, and no course grade would be received.

The intervention component consisted of intervention sessions taught by either maximum instruction or minimum instruction. The teachers were assigned one of the

instructional types for five consecutive 30-minute pharmacology calculation sessions.

Maximum instruction guidelines for the study were adapted from the Direct instruction model. Briefly, the teacher's role was that of facilitator. The environment included guided instruction and feedback. The teacher presented examples and responded to specific questions within the group. If a student asked a question, the teacher answered completely and directly. The teacher followed the question with another example to further clarify the information. The same content sequence and problems were followed in the other maximum guided sections (Appendix E).

The maximum instruction included the orientation, presentation, structured practice, and guided practice components based on content reflected in objectives and worksheets for the session. Each session began with orientation, which included reviewing the lesson from the previous session. If a correct answer was not elicited or if there were questions, a second problem was presented before progressing to the assigned topic of the session.

Next, the objective for the session was stated, and specific instructions for the organization of the teaching

session were reviewed. The worksheet with the two completed problems was distributed.

The presentation component consisted of working two to three example problems that followed the objective for the session. Each problem was separately worked on the chalkboard and followed the steps that were listed on the worksheet. The drug calculation problem was calculated step-by-step and was written in a step-like progression on the chalkboard. The two problems were not erased, but were utilized as references for future questions.

The structured practice session began only after the students verbalized their understanding of the step-by-step calculations of the presentation problems. The practice section coincided with worksheet number 2 that was distributed at this point. The students began working on problems, and the instructor interjected questions to students at each step of the calculation and recorded the step on the chalkboard. Three to five problems were completed in this manner. If students responded with incorrect answers, the instructor directed the student to the particular step in the presentation problems on the chalkboard or on the worksheet number 1 for comparison. If the students

correctly completed four to five problems, the instructor progressed to the guided practice component.

The fourth section, the guided practice section, coordinated with worksheet number 3 for the session. The students worked on the worksheet independently with the instructor actively screening the students' work as they progressed. If the student arrived at an incorrect answer, the instructor guided the student to the presentation problems on the board. Students worked on problems until time elapsed. Worksheets were not sent home with the student.

The independent practice was scheduled to be the final section of the intervention session. This was conducted based on the time remaining in the session and was not made up at the onset of the next session or as an assignment.

The minimum instruction guidelines followed a more informal organization with an individual focus. The instructor presented an example of the problem on the board. A worksheet consisting of 20 problems related to the objectives was distributed. The instructor served in the monitor role and indirectly answered students' questions by referring to the initial example on the chalkboard. The question was

refocused to the student rather than the instructor (Appendix D).

The minimum guidance teaching consisted of the instructor distributing a packet of four worksheets that were identical to the maximum guidance worksheets. Again, the packets reflected the objective for the session. The instructor stated the objective for the session and instructed the students to complete the packet. The students were informed the session was not timed and the object was not to complete all worksheets in the packet. The instructor informed the students to raise his or her hand if questions arose.

Instruments

GEFT. The instrument considered most appropriate for this study was the Group Embedded Figures Test (GEFT), which was deemed more applicable for group administration than the Embedded Figures Test. In addition, it was more cost effective and more readily available than the BAT, RRT, and RFT. Finally, the GEFT required less time to administer.

The correlations between GEFT and EFT were reasonably high. The GEFT had a Spearman-Brown reliability coefficient of 0.82 for both females and males when the GEFT scores in Section 2 and Section 3

were computed. Validity of the GEFT was evaluated with regard to the EFT. The Pearson correlation between the GEFT and the EFT was found to be stronger for men (0.82) than for women (0.63) (Witkin et al., 1971).

The GEFT contains three sections of shaded items, with the first section consisting of seven very simple practice items that were not scored. Two minutes were allowed for completion. The second and third sections presented nine more difficult items and were limited to 5 minutes per section for completion.

The subject was shown a simple figure, such as a square or rectangle. Next, the subject was shown a more complex figure on another page that had the same simple figure embedded. The subject then was asked to find the simple figure within the more complex figure by tracing the simple figure. The score consisted of the total number of simple forms correctly traced in the second and third sections combined, for a possible total of 18. Omitted items were scored as incorrect (Witkin et al., 1971).

Critics say the GEFT instrument is biased in favor of the FI individual. The instrument more easily measured analytic ability instead of interpersonal

1983).

Pharmacology instrument. Prior to formulating the drug calculation or pharmacology instrument, the investigator developed tasks or objectives for the pharmacology instrument and the teaching sessions. Although the content for the first and second sessions was similar to an individualized module method for drug calculation instruction implemented during the Fall terms of the curriculum, the organization of the content, the objectives, and the method of instruction were unique to the study. The content was determined after consulting with three nurse educators as well as current published drug calculation texts (Radcliff & Ogden, 1987; Moore, 1986). The tasks included calculating drug dosages that are in like units, calculating drug dosages that are in unlike units of measurement, calculating drug dosages based on units and millequivalents as systems of measurement, and calculating reconstituted drug problems and intravenous flow rates. A possible fifth task, calculating intravenous infusion time and concentration of drug per unit of time, was identified, but was deleted to allow for a review of units one through four during the final session.

Following the identification of tasks, objectives for each session were developed. Based on the objectives for the sessions, a pharmacology instrument was developed (Appendix F). The instrument was limited to 18 items in order to allow approximately 1.5 minutes per item during the 30-minute time frame. The same instrument was utilized for the pretest and the posttest administration.

Content validity was determined by acquiring feedback from three nursing instructors from Campus B. The instructors were volunteers who had previously taught the first level of the program. The study was briefly outlined, the objectives were listed, and the instrument was analyzed with the focus on items appropriate for first-level nursing students.

Split-half reliability was established by administering the instrument to a group of 22 volunteer second-level nursing students enrolled at Campus B. The Spearman-Brown correlation was 0.86.

An overall test-retest reliability was obtained from the instrument based on administration of the instrument to 30 volunteer second-level nursing students also from Campus B. Twenty-two students

days later. A 0.43 agreement was obtained utilizing the Pearson r product moment between the pretest and posttest scores.

Satisfaction questionnaire. A one-page questionnaire was developed by the researcher to measure the subject's level of satisfaction with the teaching sessions and methods utilized (Appendix G). The first part consisted of five questions that pertained to the degree of satisfaction by using a 5-point Likert scale. The responses were marked on a continuum from "extremely" to "not at all." Four inches of the bottom of the form were left open for comments. Subjects were also requested to indicate their age and gender on this form.

Content validity was assessed by nurse educators to determine the extent to which the instrument measured the intended area effectively. Comments were utilized in formulating the final draft of the satisfaction instrument.

Summary

The pretest-posttest design was implemented to determine the effects of two types of instructional guidance for pharmacology calculations based on the

in the first level of an associate degree nursing program participated in the study.

The 76 students who agreed to participate in the study were nonrandomly assigned to an instruction group, minimum or maximum guidance as were nursing faculty members. Students' cognitive style was measured by the GEFT and pharmacology knowledge by the pharmacology instrument during the initial session. Following the initial assessment session, 5 teaching sessions on pharmacology calculating skills were presented to each of the 8 groups over a 5 week period. The intervention component ended with a seventh session for administration of the pharmacology posttest instrument and the satisfaction instrument.

The intervention sessions were either based on maximum or minimum guidance as the teaching method for pharmacology instruction. The maximum guidance offered students a structured format to complete the pharmacology worksheets with direct instructor guidance and the minimum guidance sessions focused on an independent and individual foci with instructor facilitation.

Chapter IV

Analysis of Data

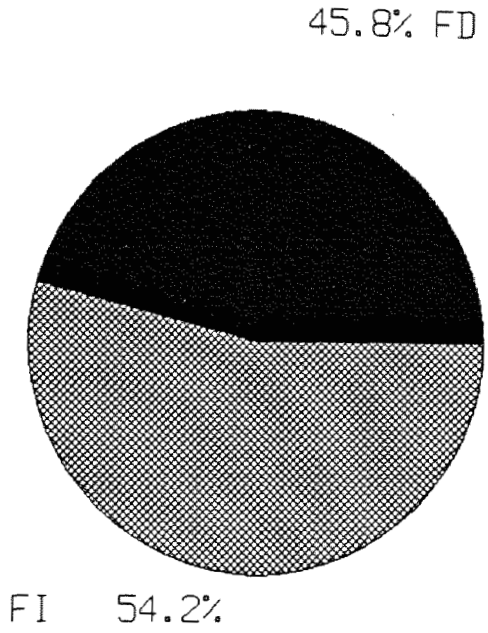
Descriptive Data

Of the original 100 nursing students who were invited to participate in the research study, 76 students volunteered to attend the teaching sessions. The subjects were divided into eight groups, four maximum instruction and four minimum instruction groups. The subjects were assigned based on subjects' convenience and class schedule.

Twenty-four of the students attended the initial testing session for the pretest and the GEFT, a minimum of three intervention sessions, and the final testing session for the posttest and satisfaction questionnaire. The data-producing sample consisted of 24 students, 32% of those invited to participate.

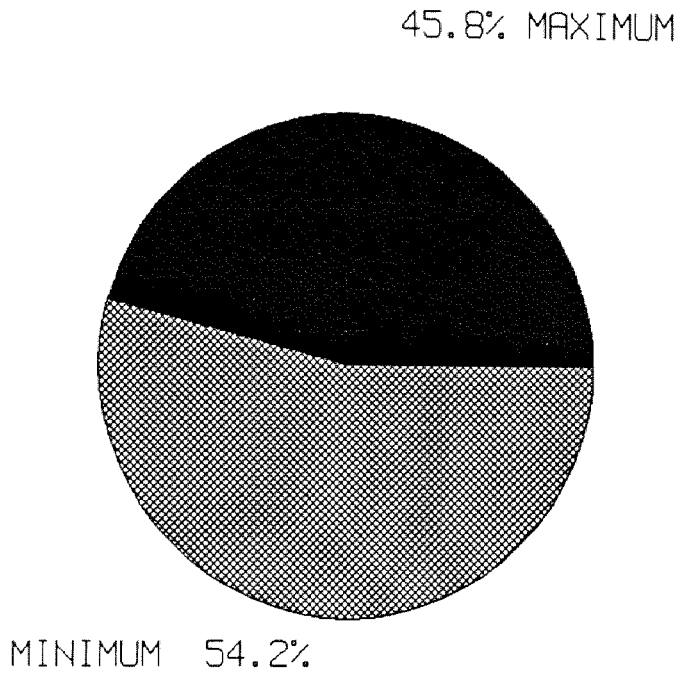
The sample was all females. Eleven students had a GEFT score of less than 9, and were therefore classified as field dependent, and 13 students scored higher than 9 on the GEFT, classifying them as field independent (Figure 1).

Figure 1. Proportion of Field Dependent Students to Field Independent Students



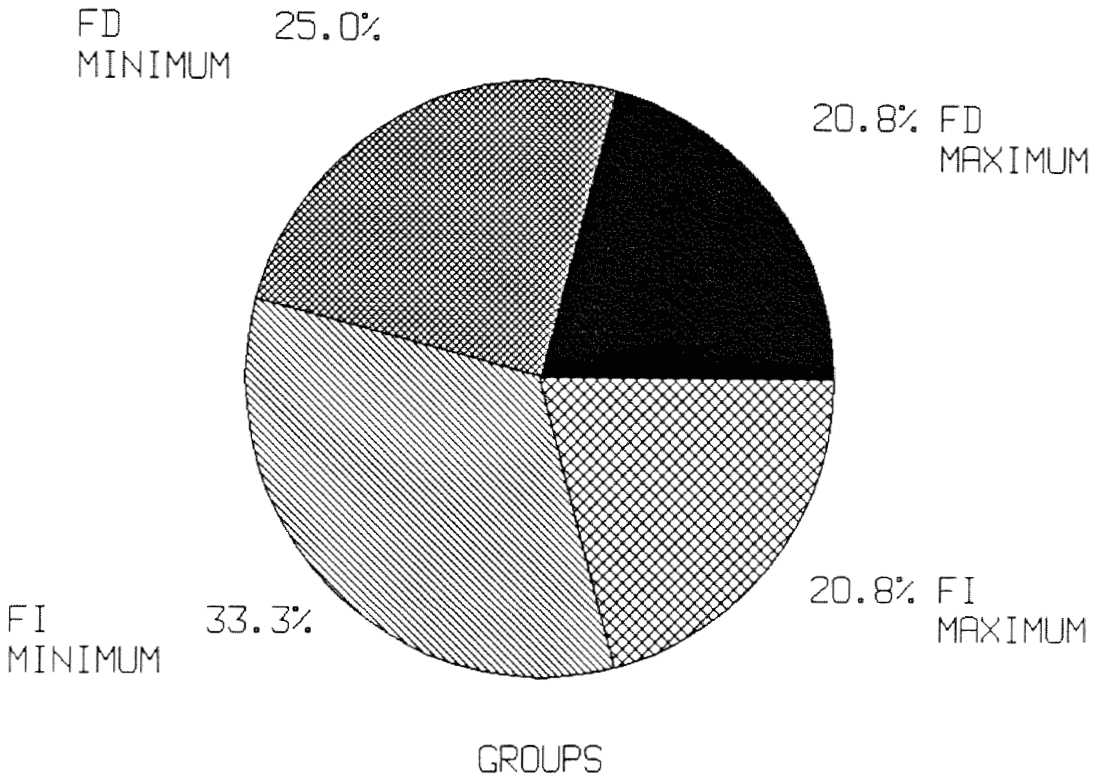
The mean GEFT score for the 24 subjects was 9.50 on the FDI continuum of 0 to 18 with a range of 18. The standard deviation of the GEFT score was 5.09. Forty-two percent of the sample was in the maximum intervention group (n=10), and 58% (n=14) was in the minimum intervention group (Figure 2). The groups

Figure 2. Proportion of Subjects Assigned to Minimum and Maximum Instruction



became smaller when considering both cognitive style and type of instruction level as depicted in Figure 3.

Figure 3. Proportion of Field Dependent and Field Independent Students Taught by Minimum and Maximum Instruction



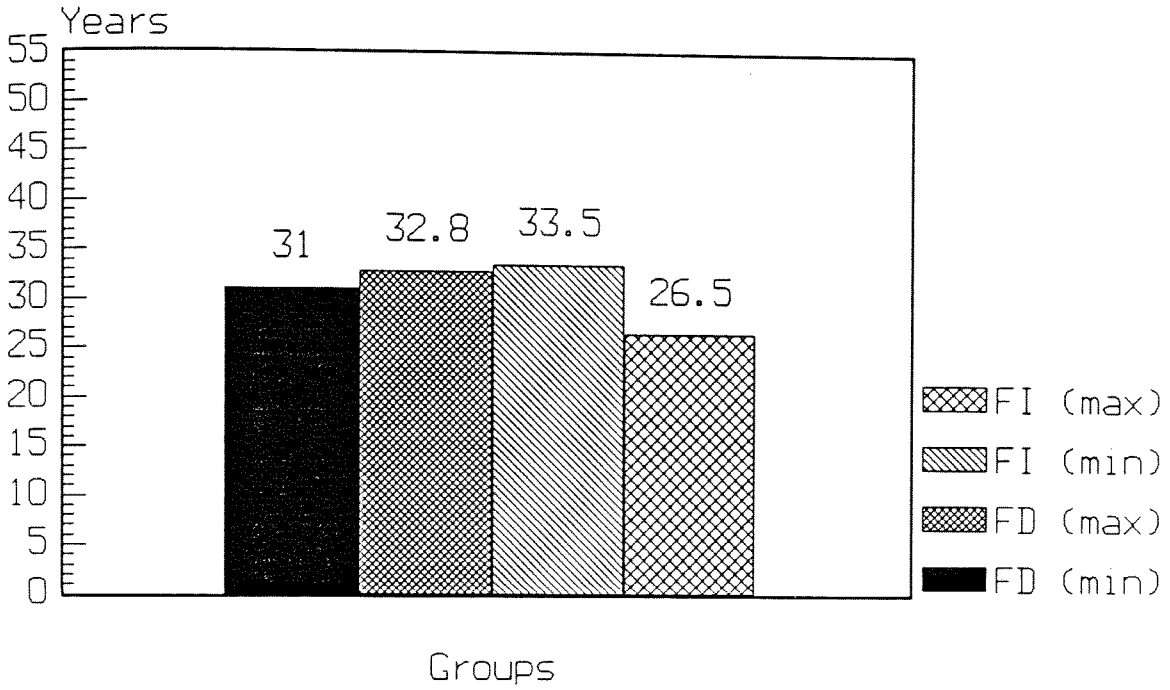
The ages ranged from 21 to 47 years with a mean age of 31.5 and a standard deviation of 7.17. The mean age for the field dependent group and the field independent group is listed in Figure 4. A *t* test was

Figure 4. Comparison of Mean Age for Field Dependent and Field Independent Students

used to determine if the field independent and field dependent subjects differed in age. No significant difference was found (t=-0.60, p<0.556).

Mean ages for the four subdivisions ranged from 26.5 to 33.5. The FI students with minimum instruction maintained the oldest group (Figure 5).

Figure 5. Comparison of Mean Age of Students When Considering Cognitive Style and Type of Instruction



Crosstabulation between age and GEFT indicated 50% of the students with a GEFT of 10-18 (field independent) were in the age category 25-29. Thirty-six percent of the students who were classified as field dependent were in the 30-34 age group (Table 1).

Table 1. Crosstabulation of GEFT Scores and Age

		Age					
GEFT	n	20-24	25-29	30-34	35-39	40-44	45-49
0-8	11	1	2	4	2	2	0
10-18	13	2	6	2	0	2	1
	24	3	8	6	2	4	1

Descriptive satisfaction data were measured by the five items on the student satisfaction questionnaire (Appendix G). The percentage of students and actual number of responses to each item are summarized in Table 2. Seventy-six percent of the nonmatched

Table 2. Comparison of Students' Perception of Instruction in Matched and Nonmatched Groups

Item	E	V	M	S	N
(E=extremely, V=very, M=moderately, S=slightly, N=not at all)					
Increase accuracy					
Matched	8%	15%	38%	31%	8%
Nonmatched	0%	55%	36%	9%	0%
Reinforce your skill					
Matched	8%	8%	38%	31%	15%
Nonmatched	0%	55%	49%	0%	0%
Dissatisfaction with presentation					
Matched	8%	15%	8%	23%	46%
Nonmatched	0%	0%	9%	9%	82%
Increase confidence					
Matched	0%	23%	23%	31%	23%
Nonmatched	27%	49%	18%	0%	9%
How helpful is this method?					
Matched	23%	15%	31%	15%	15%
Nonmatched	64%	18%	0%	9%	9%

students felt the teaching sessions increased their confidence in drug calculating, extremely or very, while only 23% of the matched students indicated the teaching sessions increased their confidence to this degree.

Responses to the questionnaire were assigned a numerical value of five (for most favorable) to one (for least favorable), with question number three written in reverse. The maximum student rating score on the five items was 25 for highest response and a minimum of 5 for lowest score.

The data for describing the satisfaction variable are as follows: mean score for FD and FI students (Table 3); satisfaction mean scores for groups when

Table 3. Comparison of Satisfaction Scores for Field Dependent and Fieldd Independent Students Between Minimum and Maximum Instruction

Group	n	Method	Mean	Range	Sd
FD	5	Max	16.00	11-23	4.416
FD	6	Min	18.67	10-23	5.125
FI	8	Min	15.25	5-20	5.471
FI	5	Max	21.00	19-23	1.871

Table 4. Comparison of Mean Satisfaction Scores of Groups with Minimum Instruction and Maximum Instruction Methods

n	Group	Mean	Range	Sd
14	Minimum	16.71	5-23	5.410
10	Maximum	18.50	11-23	4.140

and satisfaction mean score for matched groups-FD with maximum instruction and FI with minimum instruction and nonmatched groups- FD with minimum instruction and FI with maximum instruction (Table 5). The

Table 5. Comparison of Mean Satisfaction Scores of Groups Whose Cognitive Style were Matched and Nonmatched with Instruction Method

n	Group	Mean	Range	Sd
13	Matched	15.5385	5-23	4.909
11	Nonmatched	19.7273	10-23	4.002

satisfaction scores did not vary between the FD and FI students and the minimum and maximum instruction groups when matched and nonmatched groups for cognitive style and instruction type were not considered. When matched students were compared to nonmatched students, the nonmatched students reported higher satisfaction levels than the matched students.

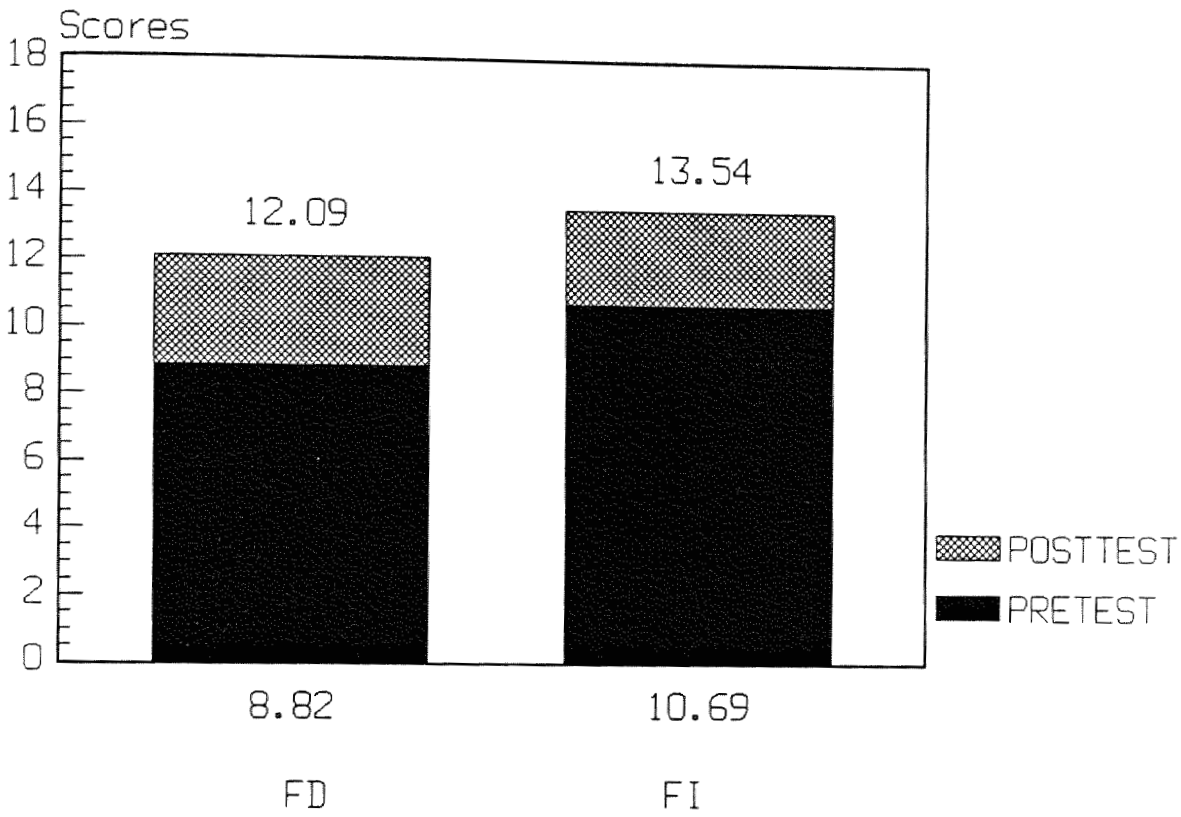
measured utilizing the 18-point pretest and the same 18-point posttest at the conclusion of the intervention component. Achievement scores were determined by subtracting the pretest score from the posttest score and then measuring central tendency scores, as is illustrated in Table 6.

Table 6. Comparison of Pharmacology Pretest Scores, Posttest Scores, and Achievement Scores Without Regard for Instruction Method

Test	Mean	Range	Sd
Pretest	9.833	3 to 16	3.510
Posttest	12.875	5 to 17	2.997
Achievement	2.958	-4 to 10	3.532

The average for the field independent group's pretest score was 1.88 points higher than the field dependent group, as indicated in Figure 6. The

Figure 6. Comparison of Pretest and Posttest Scores for Field Dependent and Field Independent Students

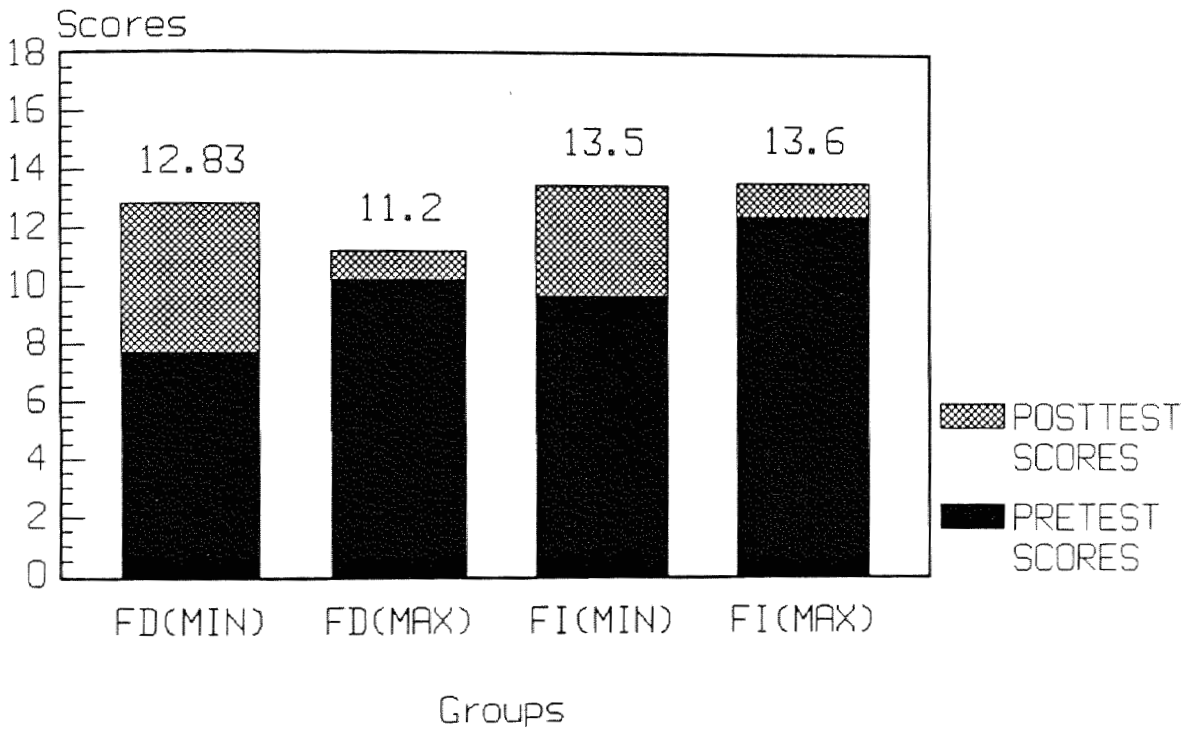


posttest score was 1.45 points higher for the field independent group when compared to the field dependent group. No significant difference was found between the pretest scores of the field independent students and the group of field dependent students (t=1.35, p<0.190) or between the posttest scores for both groups of students (t=1.19, p<0.247).

All four of the groups, FD with maximum instruction, FD with minimum instruction, FI with

scored higher on the posttest after some instruction, matched or not matched to cognitive style (Figure 7).

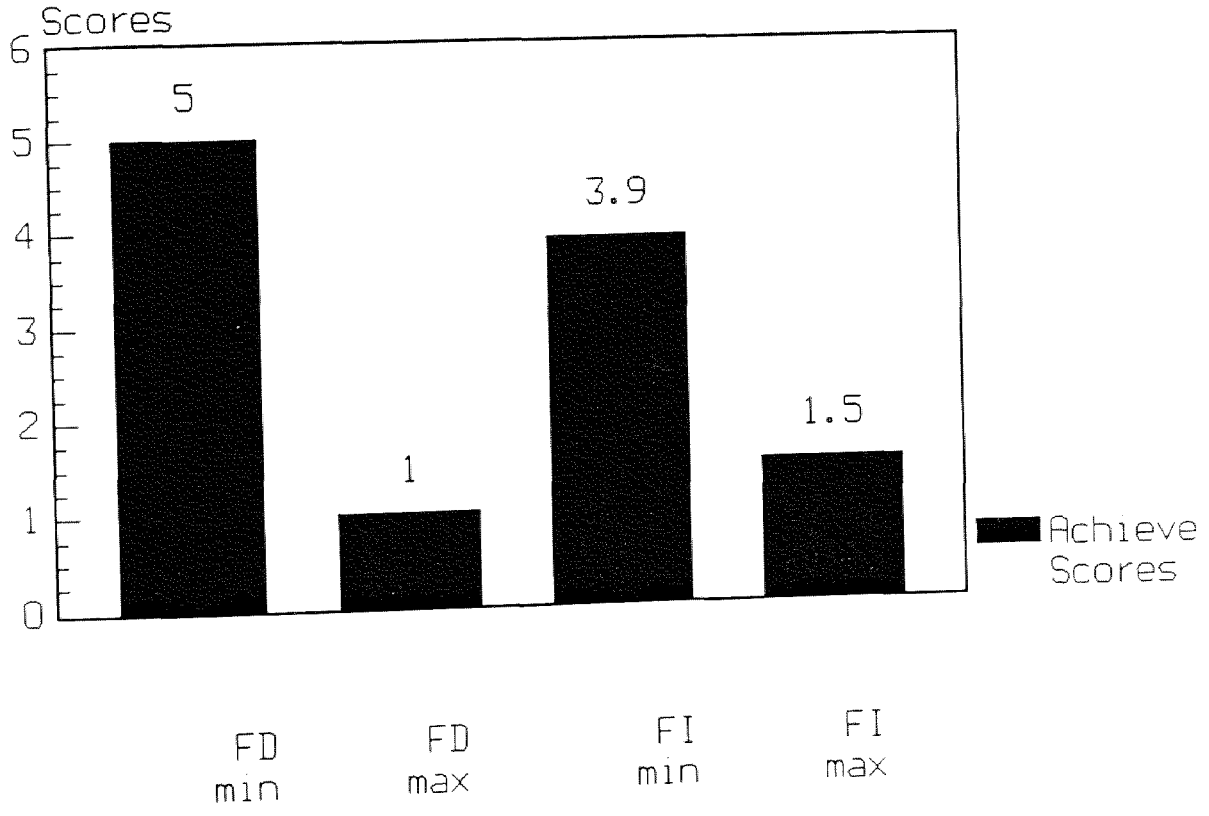
Figure 7. Comparison of Pretest and Posttest Scores When Considering Cognitive Style and Type of Instruction



Overall achievement scores were 3.00 for FD students and 3.00 for FI students when considering cognitive style only. The FD subjects with minimum instruction ranked the highest for achievement scores. When considering the two matched groups (field dependent students with maximum instruction and field

independent with minimum instruction) and the two nonmatched groups (field dependent students with minimum instruction and field independent with maximum instruction), the mean scores for achievement were lowest for students with maximum instruction and highest for minimum instruction (Figure 8).

Figure 8. Comparison of Achievement Scores for Field Dependent and Field Independent Students When Considering Cognitive Style and Type of Instruction



Achievement

The first and second research hypotheses examined the differences between achievement scores for students who were taught by minimum guided instruction and maximum guided instruction. The pretest score was subtracted from the posttest score to obtain an achievement score for each of the four groups, FD taught by maximum instruction, FD taught by minimum instruction, FI taught by minimum instruction, and FI taught by maximum instruction. There was no difference between minimum and maximum FD students and no difference between minimum and maximum FI students (Table 7). There was also no significant difference

Table 7. Difference in the Achievement Scores on a Pharmacology Test Between Students Taught by Minimum and Maximum Instruction When Considering Cognitive Style

FD	6	Minimum	4.833	1.94	0.090
FD	5	Maximum	1.000		
FI	8	Minimum	3.875	1.51	0.158
FI	5	Maximum	1.200		

in achievement scores between the FD and FI students who had minimum instruction, and no significant

difference in achievement scores between the FD and FI students who had maximum instruction (Table 8).

Table 8. Difference in the Achievement Scores on a Pharmacology Test Between Students Taught by Minimum and Maximum Instruction

Cognitive Style	n	Method	Mean	t	p<
FD	6	Minimum	3.875	-0.53	0.606
FI	8	Minimum	4.833		
FD	5	Maximum	1.000	0.10	0.921
FI	5	Maximum	1.200		

The research hypotheses were not supported by this study. Field dependent students who were taught by maximum instruction did not obtain a higher achievement score on pharmacology tests than those taught by minimum instruction. Field independent students who were taught by minimum instruction also did not obtain a higher achievement score on the pharmacology test than those taught by maximum instruction.

Satisfaction

The third research hypothesis considered whether there was a significant difference between the degree

calculations section of the course for nursing students whose cognitive styles are matched with instruction style and students whose cognitive styles are not matched with instruction style. The differences in instructors were not considered when analyzing the degree of satisfaction with the mode of instruction.

A two-tailed t test was used to compare the satisfaction scores of the field dependent students who were taught by maximum instruction with the satisfaction scores of the field dependent students who were taught by minimum instruction. The direction of the difference in these scores was unknown, therefore, the two-tailed t test was chosen. No significant difference was found (t=0.91, p<0.385). Field independent students who were taught by maximum instruction were significantly more satisfied than those taught by minimum instruction, contrary to what was proposed (t=-2.24, p<0.047).

A two-tailed t test was also utilized to focus on matched groups, field independent and minimum instruction and field dependent and maximum instruction, and the nonmatched groups, field independent and maximum instruction and field dependent and minimum instruction, when comparing perceptions of

teaching method as measured by a satisfaction instrument. The students whose cognitive styles were not matched to the selected instruction type were significantly more satisfied with the method of instruction than were the matched student (t=-2.26, p<0.034).

Pretest Scores and Cognitive Style

The fourth research hypothesis suggested pretest scores on a pharmacology calculation test would be significantly higher for field independent students than for field dependent students. The pretest was the basis for the students' pharmacology scores. The students had had no intervention of minimum or maximum guidance for pharmacology content at this point.

A one-tailed t test was utilized. No significant difference was found between the pretest scores of FD students and FI students' pretest scores (t=0.675, p<0.095).

Achievement and Gender

The final hypothesis concerned a relationship between gender and student pretest scores on a pharmacology calculation test and gender. The sample consisted of all females, therefore no data were available to test this hypothesis.

Incidental Findings

An ANCOVA was utilized to determine whether maximum and minimum guidance affected achievement scores when covarying for age. The F value for FD was 2.922 with a significance of $p<0.131$. The F value for FI students was 2.194 with a significance of $p<0.169$. When all 24 subjects were placed together, the F value was 6.456 with a significance of 0.019 with age as a covariate. When age was held constant, the levels of guidance did influence the achievement scores for groups who were matched and nonmatched with cognitive style and instruction level.

The Pearson r was used to determine the strength and nature of the relationship between the dependent variable, pharmacology scores, and the independent variable, cognitive style. For the entire group of nursing students, a moderately positive, but significant correlation between the pharmacology pretest score and the cognitive style was 0.4624 ($p<0.01$).

A positive and significant correlation was found between GEFT and pretest for FD students (Table 9). No

Table 9. Correlation Values of GEFT With Pretest, Posttest, and Achievement Scores for Field Dependent and Field Independent Students

Type	FD	FI
Pretest GEFT	r=0.6361 p=0.0350	r=0.3937 p=0.1830
Posttest GEFT	r=0.5413 p=0.0860	r=0.0757 p=0.8060
Achievement GEFT	r=-0.0911 p=0.7900	r=-0.3520 p=0.2380

significant relationships existed between the GEFT and the pretest in FI students.

When examining relationships among the various measures in minimum and maximum groups, posttest scores were positively and significantly correlated with GEFT for minimum and maximum instruction, as were pretest scores and GEFT for maximum instruction. The data are illustrated in Table 10.

Table 10. Correlation Values of GEFT With Pretest, Posttest, and Achievement Scores for Minimum Instruction and Maximum Instruction

Type	Minimum	Maximum
Pretest	r=0.4138	r=0.6423
GEFT	p=0.1410	p=0.0450
Posttest	r=0.5352	r=0.7752
GEFT	p=0.0490	p=0.0080
Achievement	r=0.0474	r=0.1155
GEFT	p=0.8720	p=0.7510

When the various measures were examined in the four groups, FD with maximum instruction, FD with minimum instruction, FI with maximum instruction, and FI with minimum instruction, no clear pattern was noted. No significant correlations were found beween GEFT and any scores for FD students. When considering the FI students with minimum instruction, the pretest scores and the GEFT, as well as the achievement scores and the GEFT, were positively and significantly correlated, as were the posttest scores and GEFT scores for FI students with maximum instruction. A negative and significant correlation was found between achievement

instruction (Table 11).

Table 11. Correlation Values of GEFT Scores With Pretest, Posttest, and Achievement Scores for Matched and Nonmatched Students

Type	FD Maximum	FD Minimum	FI Maximum	FI Minimum
Pretest GEFT	r=0.6620 p=0.2240	r=0.6699 p=0.1450	r=0.8428 p=0.0730	r=0.7365 p=0.0370
Posttest GEFT	r=0.8532 p=0.0660	r=-0.2194 p=0.6760	r=0.9868 p=0.0020	r=-0.1969 p=0.6400
Achieve GEFT	r=0.3271 p=0.5910	r=-0.6455 p=0.1660	r=-0.3358 p=0.5810	r=-0.8583 p=0.0060

Summary

The data-producing sample included 24 females with a mean age of 31.5. The study did not support the proposed hypotheses.

First, the pretest scores did not vary between FD and FI groups. Second, the achievement scores between the matched groups, FD with maximum and FI with minimum, were not significantly higher than the nonmatched group, FI with maximum and FD with minimum.

satisfied with the teaching method than were the matched groups ($p<0.05$).

Chapter 5

Discussion

Conclusion

All students who comprised the four groups, field dependent students with minimal guidance, field dependent students with maximum guidance, field independent students with minimum guidance and field independent students with maximum guidance, were homogeneous for gender and age. The 24 students in the data-producing sample were primarily young female adults. Nearly one-half of the group identified as field dependent, and slightly over one-half was field independent.

The pretest scores averaged slightly higher for the field independent students, but were not significantly higher when compared to the field dependent students' scores. The cognitive style did not influence the scores on a math test.

Even though four groups, FD students with minimum and maximum instruction and FI students with minimum and maximum instruction, presented with positive achievement mean scores, no significant difference was found between the achievement scores for the matched groups, FD students with maximum guidance and FI

students with minimum guidance, and between the nonmatched groups, FD students with minimum guidance and FI students with maximum guidance. The students who were taught by an instruction method that was more similar to their cognitive style did not achieve higher on the drug calculation test when compared to the students whose cognitive style were not matched with a congruent instruction method. For this sample, the instruction mode did not influence the students' achievement scores.

The researcher also considered the satisfaction level of students who were taught by minimum and maximum guidance. The satisfaction scores from the four groups indicated that the nonmatched students, the FD students with minimum guidance and the FI students with maximum guidance, were significantly more satisfied with the teacher and the improved accuracy, skill, and confidence that were acquired from the teaching method utilized for drug calculation than were the students who were in the matched group, the FD students with maximum guidance and FI students with minimum guidance. Students whose cognitive style was mismatched with a congruent instruction mode were more satisfied than the matched students.

Other findings suggested that a moderately positive correlation was found between the pretest scores and GEFT scores. As GEFT scores increased or moved toward the field independent pole, the pretest scores increased. No significant correlations were noted between GEFT scores and posttest scores when considering the type of instruction group the students were assigned. The only group showing a positive correlation between achievement and GEFT scores was the FI students with minimum instruction.

Pretest scores. Although no significant difference was noted between the FI group's pretest score and the FD group's score, a slightly higher pretest average was noted for FI students. The FI students were thought to possess the analytic and structuring skills needed to solve math computations because they performed better on mathematic calculations than the FD students in an earlier study (Witkin, Moore, Goodenough, and Cox, 1977). The present study did not support that concept. A variety of reasons may explain the pretest results.

The sample population was very small, which may have had a major impact on the outcome. A second factor that may have had a significant impact on the

pretest scores was the effect of previous math courses experienced by the students. VanBlerkom (1988) recently concluded the FDI construct was predictive of math achievement primarily by influencing the number of mathematic courses completed by the student rather than by measuring analytic abilities.

A third area that may have influenced the pretest scores was the influence of the type of instruction utilized for this content because the content was taught previously in the preceding semester. Given the limitations of the institution, new content could not be taught to the students during a research study because the same intervention method must be presented to all students similarly. A future study could look at the influence of cognitive style and instruction mode for students receiving unfamiliar content.

Two final factors that may have influenced the outcome were the reliability and validity of the pharmacology instrument. The mediocre test-retest reliability obtained for the pharmacology instrument may have offered a marginal instrument for use in the study. The validity of the instrument was also questioned. Was the instrument measuring the intended students' calculation skills or the students' abilities

to memorize and apply the conversion tables within the apothecaries and metric systems and between these systems? Perhaps the instrument was not clearly measuring calculating skills, but measuring problem-solving skills and memorization skills.

Achievement. The second major area of concentration focused on the degree of achievement on pharmacology posttests after a pharmacology intervention, which may have been matched or mismatched with the students' cognitive style. Initially, all students' achievement levels were analyzed, regardless of the type of intervention introduced. Even though the FI group of students scored higher on both the pretest and posttest, the FD group improved their scores by 23% compared to the FI group who increased their scores by 14%. Although no significant difference was found, the impact of some type of intervention positively benefited all students. Since the study was working solely with a small number of volunteer students, there was no possibility of adding a control group to compare to the intervention groups.

Because the FD and FI groups were divided into those receiving minimum and maximum instruction, the achievement levels were clearly different for those

four groups' pretest and posttest scores. The group of FD students that was to receive minimum guidance averaged the lowest pretest score, 43% correct, compared to the FD students with maximum guidance, who averaged a 57% on the pretest prior to the intervention. This means the students who scored the lowest on the pharmacology pretest were placed in a nonmatched group. These students were FD, that according to the literature have encountered the most difficulty with performing math skills.

The matched group comprised of FD students with maximum guidance increased their posttest scores by an overall average of only 5% compared to the nonmatched group of FD students with minimum guidance, who improved their pretest scores by 29%. This nonmatched group was the one that had the most achievement needed to raise their scores to a similar level as the other groups.

The group of students who were FI with maximum instruction had the highest pretest average score (68%) before any instruction. The group improved their posttest scores by 7%. The FI students with minimum instruction started with a 54% pretest average and improved their posttest scores by 22%.

Both groups who received minimum guidance, whether FD or FI students, scored the lowest on the pretest and increased their achievement scores over the maximum guidance group. Several reasons may explain these unexpected results. First, the students were not randomly placed in intervention groups, but were cclassified based solely on their class schedules. A second reason could be that the reliability and validity of the instrument may have influenced the scores as discussed earlier.

Third, one group of students that received minimum guidance were assisted individually by the instructor during the administration of the pretest, which may have had a significant impact on that group. An instructor for a second group of students receiving minimum instruction explained the study and the two different levels of instruction to the students. These two groups may have been unintentionally biased by the instructors. One student in the second group called the researcher and described feelings of uneasiness and unfairness with offering more instruction to some groups than to other groups. Perhaps the students felt they needed to work harder to learn as much as the

Henry effect.

Although all groups improved their posttest scores slightly when compared to the pretest scores after the intervention, no significant difference was found between groups with matched and nonmatched instruction based on the cognitive style. A variety of explanations may support these results and raise future research questions.

The verbal and written instructions for the instruction methods were carefully reviewed, but may have been covertly individualized by the instructors' own teaching style. The instructors who individualized the sessions by explaining the study or assisting the student during the pretest reflect personal styles that were unyielding to the strict requirements of the study. A future study should include one instructor for the study to avoid the effects of the instructor individuality as a variable.

Another variable that may have influenced the outcome was the effect of the teacher's cognitive style on achievement scores. Perhaps the intervention modes were more directly guided by the individual instructor rather than the instruction method. What are the effects of matching teacher's own

student's cognitive style in minimum and maximum guided instruction groups that are more similar to their cognitive style? This question may be answered by future research.

Direct instruction was chosen as the model for the maximum guidance intervention. The critical features for this structured teaching mode include step-by-step strategies for teaching the concept, development of mastery of each step, a strategy for correction of the student errors, gradual fading from teacher-directed activities toward increased individual work, systematic and adequate practice, and a cumulative review of the newly learned concepts (Gersten, Carnine, & Woodward, 1987). Direct instruction is a specific model that gives highly structured and scripted lessons.

The design of the current research study presented only one overall list of general guidelines that were to be incorporated similarly into each of the five lessons during each week by the instructors. A formalized weekly lesson plan would have incorporated a more guided format for the teachers to follow during each session and would have decreased possible individual influences.

the student's comfort level with Direct instruction. This teaching modality has been consistently utilized in nursing curriculum.

On the other hand, the exploratory method presented for minimum guidance may have been too independent. Perhaps a future study could consider more applicable multi-dimensional problems instead of the straight question-answer type of worksheet. The same worksheets were used for both intervention modes, but the teacher's presentation was different. Perhaps the differentiation of the two was not enough contrast, but was actually quite similar.

A final area that may have influenced the study and the achievement levels of students during the different instruction sessions was the variables of student motivation and intelligence. A future study utilizing IQ and motivational factors as covariates may evoke more accurate analysis of the effects of levels of guidance on student's achievement.

Satisfaction. The data describing the student's satisfaction with the type of instruction were contrary to the outcome anticipated. The FD students with maximum guidance averaged 16 points out of a possible 25 on the satisfaction questionnaire, and the FI

students with minimum guidance averaged 15 points. The FI students with maximum guidance averaged the highest satisfaction score at 21, and the FD group with minimum guidance possessed the second highest mean at 19. Both groups with the highest mean satisfaction scores were nonmatched groups rather than matched groups. Again, the influences of additional variables such as teacher's cognitive style, instructor's teaching style, the student's motivation and intelligence quotient, and the limited presentation of Direct instruction model to the faculty may have largely influenced the student's satisfaction level.

When considering the type of instruction only, without regard for cognitive style, all students who received minimum guidance obtained an average score of 16.7, and the group with maximum guidance received a mean satisfaction score of 18.5. Neither minimum nor maximum guidance was more satisfying to the students.

Specific descriptive data from each of the five questions on the satisfaction questionnaire also revealed unexpected results. First, the 55% of students who were not matched with the instruction method and 23% of the matched students felt the

effective in increasing their accuracy in drug calculations. Thirty-nine percent of the matched students indicated the sessions offered no assistance or slight assistance with increasing their accuracy in calculations.

Second, 55% of the students who were not matched with their instruction method reported the method of presentation was very helpful in reinforcing the skill of drug calculating, while 16% of the matched students had chosen the same category. Forty-six percent of the matched students felt the method of presentation was only slightly helpful or was not helpful at all. Again, the matched students clearly indicated a lack of satisfaction with the intervention method utilized during the sessions.

Third, the nonmatched students indicated they were not dissatisfied with the way the teacher presented the teaching sessions. Sixty-nine percent of the matched students denied being dissatisfied with the teaching sessions, and 23% indicated they were either extremely or very dissatisfied with the way the teacher presented the sessions. In general, the students from both the nonmatched and matched groups were satisfied with the

Fourth, of the nonmatched students, 76% were more confident in drug calculations after the sessions. Only 23% of the matched students felt the sessions increased their confidence, and 54% indicated the sessions had only a slight impact or no impact at all on increasing their confidence. The nonmatched students were happier with sessions increasing their confidence in drug calculating.

The final question on the questionnaire also was supported by the nonmatched students rather than the matched students. Eighty-two percent of the nonmatched students indicated they felt the sessions would have been helpful if the sessions would have been offered during the previous term when the content was required as part of the student's grade. Thirty-six percent of the matched students felt the sessions would have been extremely or very helpful during term one, while 30% of the students indicated the sessions would have been slightly helpful or not helpful at all.

The written comments were not consistent with the Likert scale input from the students. The FD students who were taught by maximum instruction indicated the lessons were too short. Specific comments included the following:

> My only comment is that some of the sessions just weren't long enough to grasp the concept. The sessions really helped me and I think offering a class would be very helpful.
>
> I think this was still not enough time going over conversions. I think more time needs to be spent on each lesson.
>
> I feel that these sessions need to be longer because we can only touch the surface of it and drug calculation is very important. It is too bad that we can't spend more time reinforcing it. These sessions did help me and reinforce the teaching so that was helpful.
>
> Attendance is a factor in every class. When you miss several classess you miss things that help you. I think if this was a required class I would make more of an effort to get to class.

Overall the FI students who were taught by minimum instruction indicated the teaching sessions increased anxiety and lacked in teacher instruction and feedback. The written comments included:

> If I had known how little I would learn, I would never have volunteered.
>
> Increased my anxiety level considerable.
>
> I really feel this way of teaching drug calculations was 100% better than the way we were taught this past fall. I enjoy having an instructor there to ask questions. I would like to have about 30 minutes of lecture with this unit per week.
>
> I felt it helped me to remember how to do some of the calculations. It helped refresh my memory. I feel it would help to do this each semester for I tend to forget how to do some of the problems when I don't use them all the time.

> I think a program where the instructor played a more active role would be better.
> I would have preferred dependent learning so I'd know for sure if I was doing them correctly.
>
> The teaching sessions needed verbal reinforcement. The number of problems helped and the experience was great.

The nonmatched group with FD learners and minimum instruction also verbalized frustration with their method because of lack of instructor involvement. Some students also compared the teaching sessions to their independent modules offered for math instruction during the preceding semester. Specfic remarks included:

> The practice was helpful but the low assist method was frustrating at times.
>
> These teachings would've helped me feel alot less apprehensive if preesented last fall when we started drawing up medications. I felt lost at that time and now I'm alot more confident.
>
> I thought that we were being taught on math not to do it and ask questions if we needed help. I feel that the math should the TAUGHT as a requirement course. I will need math thru out my life span. I felt I was again teaching myself.
>
> I feel like these sessions really helped in reviewing the drug calculations. I feel like I learned a lot more doing these sessions than I did with the math modules. Thank you for your patience.
>
> These sessions helped me tremendously. I just wish I could have been in the dependent group for more assistance. I still have some uncertaincies.

The other nonmatched group of FI students with

than those taught by minimum instruction, consistent with the lack of conclusive evidence in the literature. The timing of the study may have had an impact on the nonmatched students. All students had studied math problems and drug calculations from individual modules during the preceding semester and had been tested on the content. The students were now in the clinical areas and were applying the drug calculations in real situations. The instruction may have served as a review for the students and may have been perceived as very appropriate even though a different instructional method may have been better. The students did not comment on being frustrated with the laborious steps utilized to present the content. The students admitted that the sessions assisted with reinforcing this previously required content. The written comments included:

> The reason behind it being mostly moderately effective is because I didn't spend any other time outside of our sessions reviewing. I think this is a very good idea to offer more instruction next year to first year students.
>
> I learn best by repetition on any form of math. I will need a lot more to cement it to instant recall.

> something different. If there were problems we could have taken home to look over after learning the methods it would have been helpful in remembering the methods used.
>
> The sessions were most helpful to me in that they were reinforcing my basic concepts to do math problems. The continual reinforcement helped to build my own confidence for working through the math problems.

The data analysis of the satisfaction variable indicated the groups who were not matched with their cognitive style, FD with minimum guidance and FI with maximum guidance, were significantly more satisfied with the instruction than were the matched groups, FD with maximum guidance and FI with minimum guidance. A couple of reasons may explain these results. Kent-Davis and Cochran (1989) contend that FI students have more cognitive flexibility. They are more efficient in choosing approaches to tasks whereas the FD students are more limited in this ability. The FI students may have been more prepared to adjust to the type of instruction even when it was nonmatched according to their cognitive style.

The validity of the intervention modes may have also influenced the student's satisfaction level. The researcher did not analyze the intervention modes for validity prior to administration.

itself may have significantly influenced the data. The tool asked broad questions rather than specific questions that may indicate preferences for the specific instruction method, therefore, explaining the incongruency between the written comments and the Likert scale.

Math anxiety is a widely documented phenomenon. Hadfield and Maddux (1988) found that anxiety was higher for FD secondary students than for FI students who were enrolled in high school math courses. When considering the low-achieving FI students and low-achieving FD students, no significant difference was found. A future study could include anxiety as an independent variable or as a covariate.

Witkin, Moore, Goodenough, & Cox (1977) indicated FI students performed at a higher level in different subject areas than FD students with mathematics being one of those subjects. A future study may include incorporating a neutral topic into the minimum and maximum guidance levels for FD and FI nursing students rather than the content from the math subject area.

Incidental findings. When age was held constant, achievement scores were influenced by the type of

affecting pharmacology achievement scores for students.

As the GEFT scores increased, the math pretest scores also increased. The data from the other smaller matched and nonmatched groups did not reflect any trends or outstanding data. The instruction guidelines chosen to depict minimum and maximum guidance may have been too similar or not authenic concepts from the models chosen for the study. The small data-producing sample may also have had a significant impact.

Implications for Nursing

Although the generalizations from this study may be limited, consideration needs to be given to implications for nursing education and nursing practice. The main implication is the need for nurse educator's continued awareness of the influence of the individual personality characteristics or cognitive style when choosing teaching strategies for the classroom on a daily basis and for curriculum development. The personality characteristics influence many areas but have a significant impact on the student's preferred style of learning as well as the teacher's style of teaching. The type of content also influences how the teacher presents the information and

The investigator realized the study was not expected to decipher a formula for complete success, but to offer insight into the intricate process of teaching and learning. The study did expose the faculty at this particular institution to field dependence-independence.

As instructors consider a varied approach to teaching, teachers will facilitate self-development of the students so the student can better manage themselves within the learning process. Regardless of the characteristics of FI and this learner's possible increased ease with self-development, the teachers will realize that students will have varied levels of awareness of their learning needs and ability to incorporate these needs in their learning.

The relationship between cognitive style and interpersonal relationships can also influence the advisor role of nurse educators or the formal advisor role of the counselor for nursing students. Perhaps by knowing the cognitive style, the student may be advised for specific classes or more similar instructors.

Pharmacology calculations and math skills remain in nursing curriculum as an essential skill required of nursing students. The role of the nurse in administering an accurate dose of pharmacologic agent

will not be changed. Even with the computerization and pharmacy bar coding technologies to assure accurate administration of medication, the final responsibility remains with nursing. The nurse continues to be the accountable person and the final person handling the drug before it is administered to the patient.

Those in nursing practice also needs to look at how individual differences of clients and families influence the role of the nurse as an assessor and teacher. Individuals must be cared for individually.

Summary

The literature provided very little information about nursing students' cognitive style, field dependence and field independence, and the effects of matching instruction strategies to the inherent personality characteristics of the cognitive style; therefore, the study was indicated to explore this unfamiliar area. A quasi-experimental approach was used to investigate the influence of two methods of instruction, minimum and maximum guidance for nursing students who were being taught pharmacology calculations when considering the students' cognitive style. Specifically, the study looked at students'

the achievement levels of the students who were taught by matched and mismatched instruction, and the satisfaction level of those students.

The data-producing sample included 24 students enrolled in the second term of an associate degree nursing program on two campuses at a community college in the Midwest. The students' cognitive style was assessed by completing the GEFT to measure cognitive style. In addition, a pharmacology pretest was administered prior to the intervention sessions. After attending at least three of the five teaching sessions, the students completed the pharmacology posttest and a satisfaction instrument. The content had been presented during the first term of the program by individual modules and had been evaluated by the administration of four quizzes. The sequencing of the research study was determined by the college.

Statistical analysis revealed that students who were categorized as FI performed similarly on the pharmacology pretest as did the FD students. The achievement scores were not higher for students who were matched with an intervention when compared to students who were not matched with an instruction method that was similar to their personality.

characteristics. The intervention methods did not increase the scores on the pharmacology tests, however, all scores improved some with the instruction.

The satisfaction levels were higher for students who were not matched to similar instruction methods than for students who were matched. The researcher believes the placement of duplicate content in the curriculum had an impact, as did the low sample number and the use of instruction modes that were lacking in clarity. The emphasis was on the instructors' different approaches rather than the worksheets and methods chosen for the study. The handwritten comments suggested that any type of additional instruction was helpful to the students.

These findings have several implications for nursing. Nursing educators need to be aware of their own cognitive style and its influence in choosing teaching interventions and in presenting the content. By identifying the cognitive style of students, the nurse educator may offer the students insight into their learning needs as well as prepare more inherent instruction to students.

Nurses in nursing service may also assimilate the

client at the bedside. The clients' personality characteristics are essential to the nurse's role as assessor, teacher, planner, and caregiver.

The study did not offer specific data about the intervention modes for teaching drug calculations, but it did increase awareness of individual learning differences. The concept continues to linger in the researcher's quest for the superior modus operandi of education.

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APPENDIX A

CONSENT TO BE A RESEARCH SUBJECT

You have been asked to take part in a study being done by Brenda Hoshaw, a graduate student in the Division of Nursing at Drake University. The purpose of the study is to look at a different of ways to teach the pharmacology calculations and mathematics instruction content in this program.

This study involves completing the following forms: 1) exercise in finding simple geometrical figures hidden within a more complex figure (20 minutes); 2) two worksheets on drug calculations with 16 items to be completed at the beginning of the semester and the end (20 minutes each); 3) 5 questions on what you thought about the teaching of this section.

Participation in this study is voluntary. Participation in no way will influence your grade in the course or your status as a student. You will be responsible for preparing and studying the math modules or pharmacology packets on your own in addition to the assistance offered during the study.

If you have any questions regarding the study, please contact Brenda Hoshaw at 432-7203 or 838-2347. Also feel free to direct any quesitons or concerns to Brenda's advisor, Linda Brady at Drake University at 1800-443-7253 or from Des Moines call 271-2011. Please notify your instructor, Brenda or Linda if you decide to terminate your participation in the study. You may choose to terminate at any time during the study.

I have read and understand the above consent form and agree to participate in this study.
Name_____Date_____

I do not want to participate in this study.
Name_____Date_____

I request a copy of the results of the study when completed in May 1989.

Name_____

APPENDIX B

DRAKE UNIVERSITY

Campus communication

TO: Brenda Hoshaw **DATE**: 1/11/89

FROM: Linda H. Brady, Chair, HSRRC

Subject: HSRRC review of your research proposal entitled "Field Dependence and Independence and the Effect of Level of Guidance on Learning Performance of Nursing Students."

After reviewing your proposal, the HSRRC has approved your proposal as one which poses minimal risks for the subjects.

Do be aware that this committee requires an annual progress report, should your study still be in progress as of January 1, 1990. This committee also requires an abstract of your completed study regardless of completion date.

Please contact me immediately if there are any changes in methodology as it relates to human subjects, and if you have any questions or concerns in this area as your study progresses.

We wish you success with your research effort.

Sincerely,

Linda H. Brady

Linda H. Brady, R.N., Ph.D.
Chair, Human Subjects Research Review Committee

APPENDIX C

CONTRACT FOR COLLECTION OF RESEARCH DATA

This is to acknowledge the receipt of Brenda Hoshaw's prospectus. I hereby give Brenda Hoshaw permission to collect data from the nursing students enrolled in ASDN210 during the Spring 1989 semester in the Associate Degree Nursing program from January 11, 1989 thru March 10, 1989 as delineated in the submitted prospectus, entitled Field Dependence and Independence and the Effect of Level of Guidance on Learning Performance for Associate Degree Nursing Students.

I understand that Brenda Hoshaw is working under the guidance of Dr. Linda Brady, Drake University faculty advisor, and that I may contact Dr. Brady with questions relating to this research.

[signature]
(authorizing person)

DEAN - HEALTH SERVICES & SCIENCE
(title)

2-2-89
(date)

APPENDIX D

MINIMUM INSTRUCTION

GOAL	maximize student learning by providing an independent study environment for student
ENVIRONOMENT	1. "study hall" 2. student controls --instructor monitors 3. concern with student exploring independently and completing product 4. instructor is noncommital; avoids giving positive or negative reinforcement 5. independent
ORIENTATION	1. state objectives of session 2. instruct students to raise hand if question and instructor comes to student 3. distribute packet for session
PRESENTATION	1. none

PRACTICE

1. student works independently on packets
2. if student raises hand, instructor goes to student and encourages independence. Student is referred to examples listed on section .1 of packet

APPENDIX E

MAXIMUM INSTRUCTION

GOAL — Maximize student learning time by identifying tasks, breaking tasks into small steps that advocate individual pacing and by providing a variety of practice activities

ENVIRONMENT

1. instructor controls
2. student has few choices
3. highly enthusiastic, positive attitude by instructor
4. avoid criticisms, sarcasm, ridicule
5. ignore negative student behavior

ORIENTATION

1. instructor must have everyone's attention before beginning
2. review 1 problem from previous session (second problem from .4 worksheet of each packet)
3. hand out key for .4 worksheet
4. review any problems student may have
5. state objectives of lesson

6. directions for session- we will go over 2-3 examples on the board. Then we'll go over a worksheet of 5 problems together; I'll give another worksheet to work on in class; and a final worksheet for you to work on as time permits
7. Hand out each worksheet separately (not as a packet)

PRESENTATION

1. write .1 first problem
2. work problem...ONE STEP AT A TIME
3. reexplain difficult points
4. talk through steps after done writing step
5. don't erase
6. write .1 second problem
7. complete same steps (it is okay to make a mistake...verbally praise student who found error and don't erase)
8. go over .1 third problem (Don't erase)

STUCTURED PRACTICE

1. distribute .2 worksheet
2. write problem on board in fourth section of board; allow students to begin working on first problem; call on one student to answer
3. if correct response: "very good"
   "you remembered to move decimal"
   "you multiplied fraction correctly"
   praise specific behavior
4. if incorrect response: answer no
   give hints or clues referring back to example problems on board
   if correct: praise
   if incorrect: continue working with visual ie on board coaching student
5. if only 3 of 5 problems answered correctly by students you chose, distribute worksheet .3 and continue working as above
6. if 4 or 5 of 5 problems correct, move to guided practice component

GUIDED PRACTICE

1. distribute .3 worksheet (if .3 already worked because of needing more practice in PRACTICE section, distribute .4 worksheet)
2. give instructions--student works on by self
3. instructor moves throughout room while students working independently
4. correct answer on paper: positive reinforcement
5. incorrect answer: work back through visual example on board

INDEPENDENT PRACTICE

1. distribute .4 worksheet to work on in class if time available
2. instructions: will hand out key next session

APPENDIX F

PHARMACOLOGY WORKSHEET

4-digit number_____

Given the following information, calculate the amount of medication or the intravenous flow rate as indicated.

1. The doctor orders Ascorbic Acid 0.5 g. You have a bottle labeled 500 mg/tab. How many tablets will you administer?

2. The doctor orders 2000 u Heparin Sq. Available is 5000u/mL. How many mL will you administer?

3. The doctor orders 1 mg of medication. On hand you have 500 mcg/1 tab. How many tablet(s) will you administer?

4. The client is to have 500 mL D5W with 3 mEq KCL/ 100 mL. On hand you have a 500 mL bag and a vial that reads KCL 20 mEq/10 mL. How many mEq of KCL will you add to the 500 mL bag?

5. The 500 ml of D5W with 3 mEq KCl/100 ml is to be infused in 8 hr. The drop factor is 10. Calculate the flow rate (gtt/min).

6. The doctor orders 1000 mL D5W to infuse in 12 hours. The drop factor is 15. Calculate the flow rate (gtt/min).

7. The client is to receive 2 mg of medication per kg of body weight. She weighs 45 pounds. Your medication is available in 50 mg/2.5 mL. How many milligrams will your client receive?

8. How many mL of medication will you administer to the client in problem number 7?

9. The doctor orders Terramycin 250 mg. You have available capsules labeled 0.25 g/cap. How many capsule(s) will you administer?

10. On hand you have Ampicillin Suspension 125 mg/5 mL. The doctor ordered 0.25 g. How many mL will you administer?

11. The client is to receive D5NS at 100 cc/hr. Using a microdrop tubing, calculate the flow rate (gtt/min).

12. The doctor has ordered Streptomycin 0.5 g for Mr. Tim. You have available a 5 g vial of powdered medication. Directions on the vial say to reconstitute with 5.4 mL of sterile water. The resultant solution will contain 500 mg/1 mL. How many mL will you administer to the client?

13. On hand you have 0.125 mg/tab of DHT. The order reads 0.5 mg DHT. How many tablets will you administer?

14. The doctor orders Lanoxin 25 mcg I.M. Available is a vial labeled Lanoxin 0.1 mg/mL. How many mL will you administer?

15. The client is going to surgery. His pre-op is 75 mg of Demerol and Atropine gr 1/150. On hand you have 75 mg/ml of Demerol. The Atropine you have on hand is 0.4 mg/2 mL. How many mL of Demerol will you administer?

16. How many mL of Atropine will you administer to the client in problem number 15?

17. The client's doctor orders 750,000 units of Penicillin I.M. On hand you have 300,000 units/mL. How many mL will you administer?

18. The doctor orders D5W at 75cc/hr. The drop factor is ten. Calculate the flow rate (gtt/min).

APPENDIX G

STUDENT QUESTIONNAIRE

4-digit number _____

For each of the following questions, please circle one answer only that applies most to your perceptions of the type of instruction utilized during the drug calculation teaching sessions. There are no right or wrong answers. Please be honest.

1. Overall, how effective were the teaching sessions with increasing your accuracy in drug calculations?

   Extremely Very Moderately Slightly Not at all

2. In general, how much did the method of presentation reinforce your skill with drug calculating?

   Extremely Very Moderately Slightly Not at all

3. How dissatisfied were you with the way the instructor presented the teaching sessions?

   Extremely Very Moderately Slightly Not at all

4. How much did the teaching sessions increase your confidence in drug calcuating?

   Extremely Very Moderately Slightly Not at all

5. If this method of drug calculation instruction was offered during the Fall semester of the first year of the nursing program, how helpful would it be?

   Extremely Very Moderately Slightly Not at all

Please comment: